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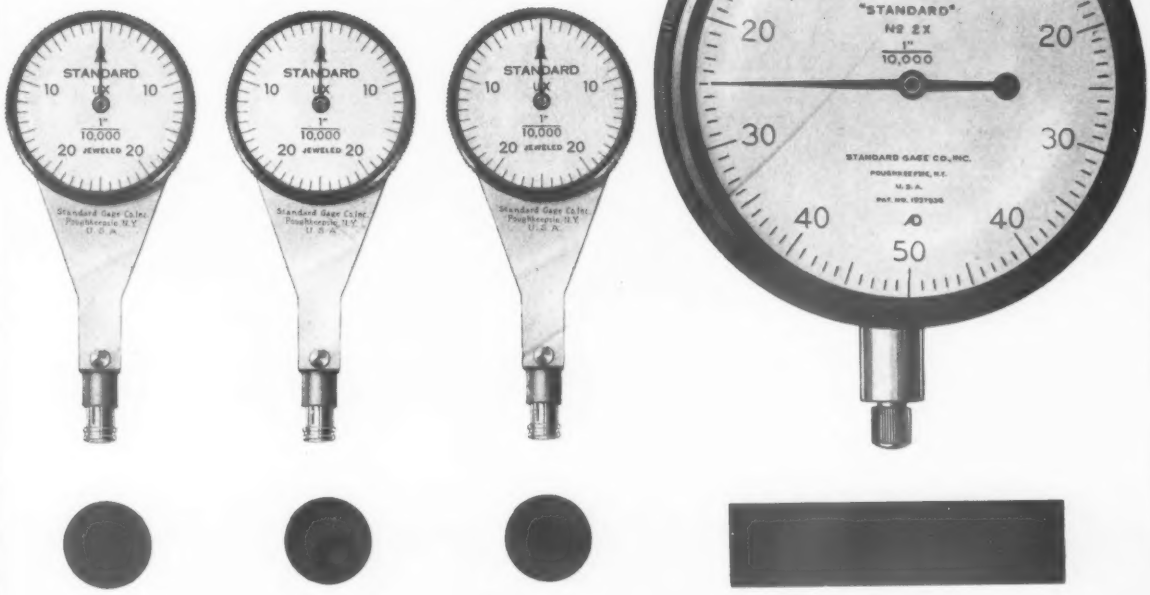

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THE TOOL ENGINEER

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R. F. V. STANTON

As Manager of the Sub-Contract Department of the Pratt & Whitney Division of Niles-Bement-Pond, R. F. V. Stanton is acquainted, as few people are, with the problems of sub-contracting in precision manufacture. He deals at great length with the basic considerations involved in his article in the next TOOL ENGINEER.

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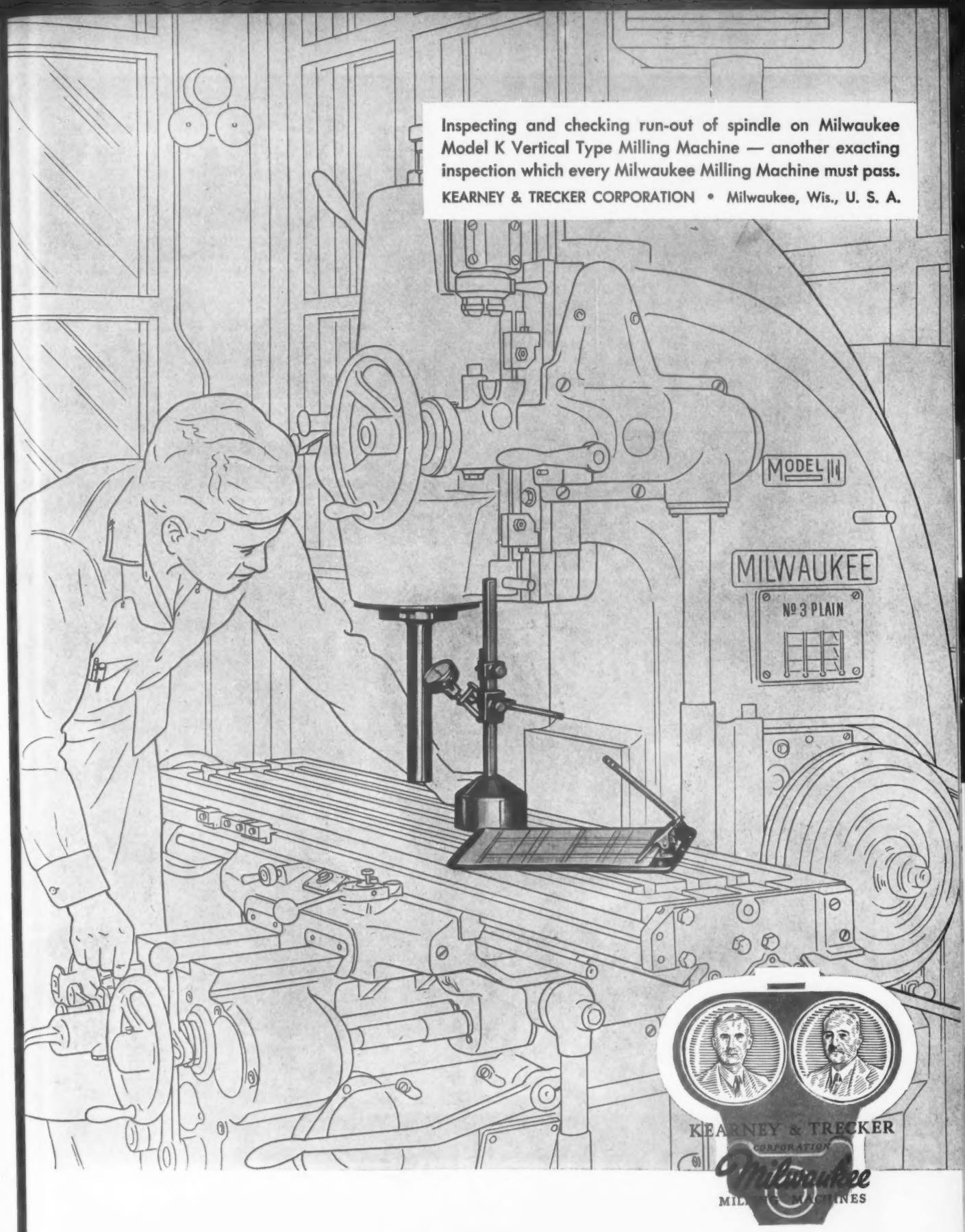


Inspecting and checking run-out of spindle on Milwaukee Model K Vertical Type Milling Machine — another exacting inspection which every Milwaukee Milling Machine must pass.

KEARNEY & TRECKER CORPORATION • Milwaukee, Wis., U. S. A.

Milwaukee MILLING MACHINES

Micromatic Anticipates Future

1. Micromatic work holding fixtures assure MAXIMUM EFFICIENCY in GENERATING FINAL SIZE, GEOMETRIC ACCURACY, SURFACE QUALITY and SURFACE FINISH.

2. Micromatic Manually Controlled Huttohones fulfill lower production needs with minimized equipment for any amount of stock removal desired.

3. Micromatic Automatically Controlled Microhones are specific purpose tools, for stock removal usually not exceeding .003" to .004" at rate of .001" per minute.

4. Micromatic Hydraulically Controlled Hydrohones and Drawfinishing Tools are specific purpose tools, for rapid stock removal up to .025" to .030" at rate of .010" to .012" per minute.

5. Micromatic Hydraulically Controlled Tubing Hones remove from .001" to .075" stock in bores up to 30" diameter x 75 feet long—at rates up to .012" per hour—generate accuracy within .0005" to .001".

6. Micromatic Hydraulically Controlled Hydrohones (with or without remote control) remove from .001" stock upwards in tubing and large diesel liners—at rates up to .012" per hour—generate accuracy within .001".

7. Micromatic Model 100 Hydrohoner with Automatic Microsize Control and Loading removes up to .002" or .003" stock in bores from ¼" to 1" diameter x 6" long—generates accuracy within .0001" to .0002" and size within .0005"—at rates up to 200-240 pieces per hour.

8. Micromatic Model 200 Hydrohoner removes up to .003" or .005" stock in bores from 1" to 2" diameter x 6" long—generates accuracy within .0001" to .0003"—at rates up to 120-140 pieces per hour.

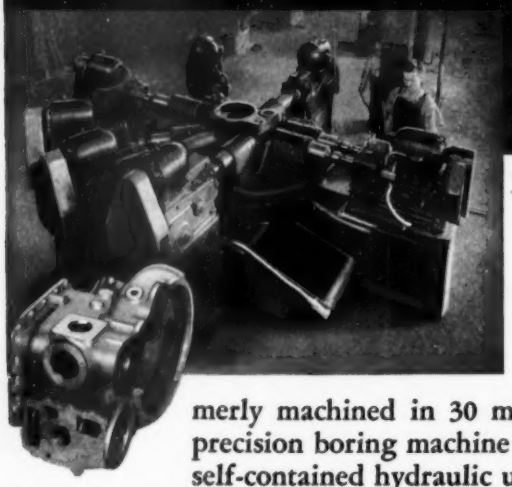
9. Write for Bulletin AR-57: "Microfinish" and Bulletin AR-60: "The Micromatic Hydrohoner".

MICROMATIC HONE CORPORATION

Production Honing Needs

1345 E. Milwaukee Ave., Detroit, Mich., U. S. A.

Production increased 6 times With Precision Boring Machine

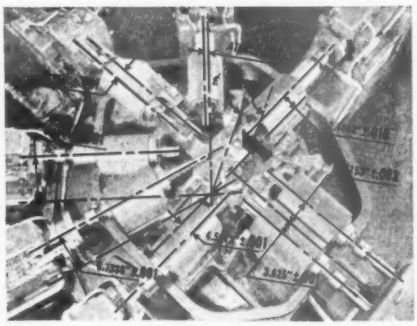


10 More Parts per Hour While Maintaining Close Limits of Machining

This aluminum-alloy accessory housing was formerly machined in 30 minutes. With this seven way, nine spindle unit-type precision boring machine the time per piece is reduced to 5 minutes. Standard self-contained hydraulic units are used. These can easily be re-arranged to meet future changes in the accessory housing. For more unit information and data write for our 75 S.H. folder.

Diameters Held to ± .0005" - Location ± .001" - Angular Location ± 15 Seconds

A prominent airplane engine manufacturer (name on request) eliminated a lot of trouble in getting the accuracies shown to the right. The nine precision spindles work simultaneously without possibility of error resulting from individual settings and numerous gaugings.



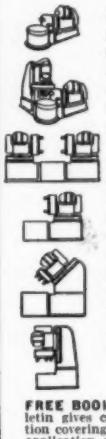
These are the tolerances specified on this job. Yours may be tougher or not, but no matter what your problem, perhaps a unit-type machine can be designed to obtain your specified accuracies while increasing your production.

In this type of precision boring machine the precision is incorporated in the boring tool design. Tool is guided in individual bushings mounted close to workpiece. Micrometer adjustment provided on each tool simplifies setting tools to accurate diameter. After properly located, guide bushings are doweled and securely bolted in place. Self-contained hydraulic units act as feed and drive equipment.

One Operator Bores 9 Holes

As in this case, unit type machine tools increase the productivity of the operator. After a few hours instruction an unskilled man can operate a unit-type machine. Usually his work consists only of loading the part, pushing a button or two, and unloading.

You Can Save From 20 to 35% with Unit-Type Machine Tools



Initial cost of these special machines is lower because drawings and patterns are available. You save engineering and pattern costs on complete feed and drive units.

Boring, drilling, reaming, tapping, and milling operations can be done simultaneously. Best combination to suit your production is available. And, future changes in your part design won't cripple the machine—units can readily be re-arranged to accommodate changes.

FREE BOOKLET. This bulletin gives complete information covering construction and application of a 3 H.P. unit. Write for your copy today . . . ask for the 75 S.H. folder.

DELIVERIES are delayed when ordering is delayed, and since it takes longer to determine the correct machine for your specific job, than to order standard catalog equipment in quantity, we urge you to investigate the possibility of adapting unit-type machines to your production — today.

TYPES OF MANUFACTURERS USING UNIT-TYPE MACHINE TOOLS

Automobiles — Airplanes
Air Conditioning
Gun and Armaments
Pencil Sharpeners
R. R. Equipment
Pipe and Fittings
Tractors — Trucks
Washing Machines
Oil Drilling Equipment
Hydraulic Equipment

W. F. & JOHN BARNES
ROCKFORD ILLINOIS

FREE Production and Tooling Ideas

Not a catalog, but a set of four bulletins describing a better way to get better machines. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a tooling or production set-up that you can use today — valuable file information for tomorrow. Write for bulletins T.E. 30 through T.E. 34.

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ACCURATE

HIGH SPEED

STREAMLINED

Thompson

Type-F 6" x 18"

TOOL ROOM GRINDER

WITH FULL HYDRAULIC AND MANUAL CONTROLS

A new machine in a well-known line

THOMPSON
PATENTED
SERIAL No
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NATURAL VISUAL ANGLE

One of the outstanding features of this new high speed surface grinder is the inclined control panel. All controls are centralized within easy reach and in direct line of vision from the operator's natural position. This makes possible faster production and more complete control of each operation for accurate work. Also the cross feed control graduated in .0005" and the super sensitive down feed dial make it possible for average operators to do extremely accurate work at a fast rate. Write for Type "F" Bulletin. Orders taken now.

THE

Thompson

GRINDER CO.

SPRINGFIELD, OHIO

MANUFACTURERS OF --- HYDRAULIC SURFACE GRINDING MACHINES . . . BROACH GRINDING MACHINES FULL AUTOMATIC AND HAND OPERATED . . . MACHINE TOOL WAY GRINDERS . . . SLOT GRINDING MACHINES . . . SPLINE GRINDERS . . . SPECIAL AIRCRAFT GRINDERS

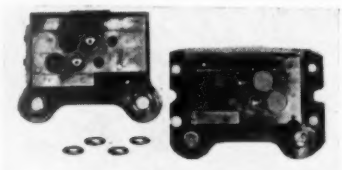
WHEN a tool is being repaired . . . it is on the "sick list". Production capacity is wasted, and that time spent "doctoring" tools sends costs *up* and machine-hour output *down*. "Sick" tools stop presses.

That means just one thing . . . tools must be made to work *more consecutive* hours before they need attention. And the best way to make sure of *continuous* production from each tool is to select the proper tool steel—and closely follow the *heat treatment* recommended to get best results from each tool steel.

Carpenter has simplified the proper selection of tool steel and provided correct heat treating data. This prescription, developed for better tool performance, is helping industry to meet the tremendous demands of defense for faster and faster production. Carpenter *Matched Tool Steels* are helping industry to make tools that boost production because they work more hours without interruptions for "doctoring". As a direct result of Carpenter's program of providing information on the proper *selection* and *heat treatment* of tool steels, the production capacity of tools, in many plants, has increased between 20% and 100%.

To help customers get the most out of every pound of tool steel they use, we have prepared this 158-page Carpenter MATCHED TOOL STEEL MANUAL. It contains the useful *Tool Index and Steel Selector*, showing which steel best meets the requirements of each tool room job. This handy MANUAL also contains heat treating and drawing instructions to make the proper *selection* of tool steel most effective. Ask your Carpenter representative for a copy of the MATCHED TOOL STEEL MANUAL. He will be glad to give you one.

THIS MANUFACTURER'S OUTPUT UP 52,500 PIECES PER MONTH



THE JOB:

A fast blanking operation on a press turning out 7,200 pieces per hour. Trouble with burrs every four hours meant wasted time for pulling, regrinding and replacing die.

By using the ***Matched Set Method*** of selecting tool steel, the company reduced trouble with burrs and got these

RESULTS:

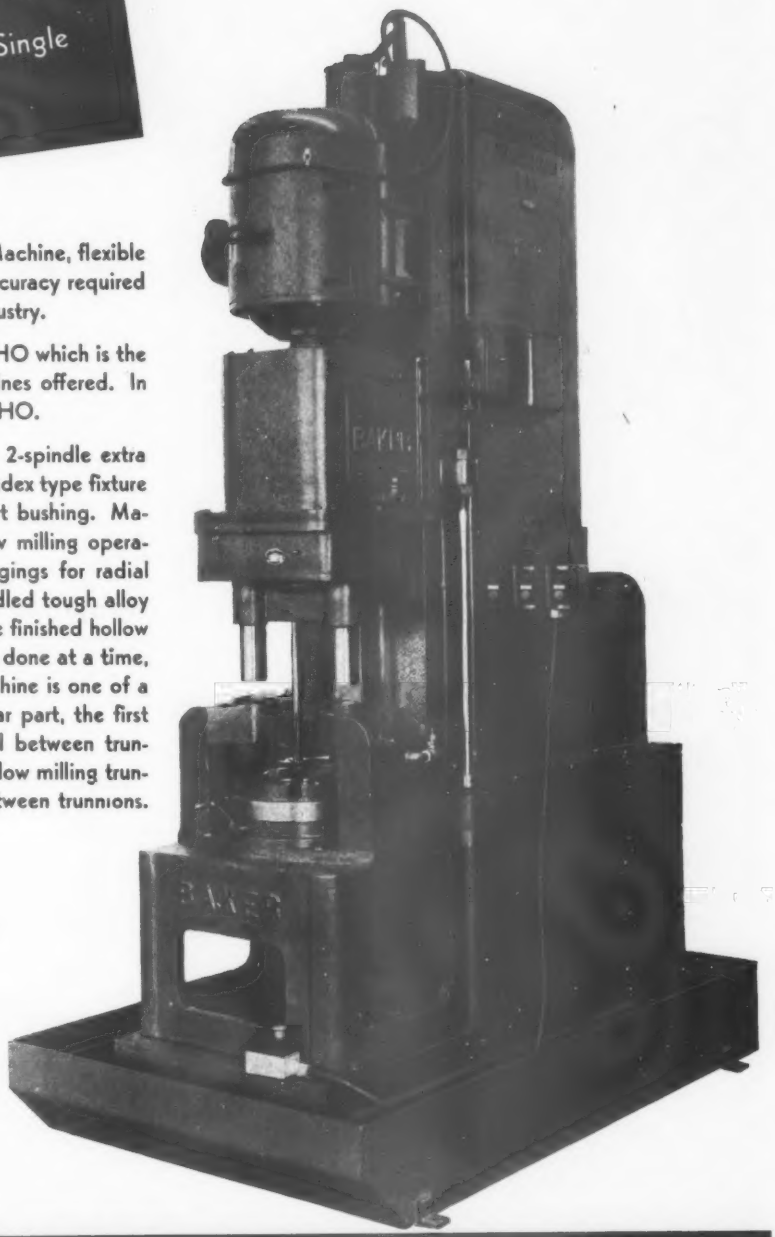
1. Production *increased* 460,000 pieces per month!
2. An *increase* in production time between grinds from 4 to 35.8 hours!
3. Press shutdown time reduced by 63.8 hours per month!

Carpenter MATCHED TOOL STEELS

THE CARPENTER STEEL COMPANY—READING, PA.

BAKER DRILLS

Heavy Duty Vertical Cleanline Hydraulic Feed Drillers. Single and Multiple Spindle.



Baker's Cleanline Vertical Hydraulic Feed Machine, flexible to use on high and low production, with accuracy required on today's requirements of the aircraft industry.

The machine illustrated is a Model No. 16-HO which is the lightest of three standard Cleanline machines offered. In this type we offer 16-HO, 26-HO and 36-HO.

Machine furnished completely tooled with 2-spindle extra heavy duty multiple spindle head. Special index type fixture with upright arranged to carry tool support bushing. Machine tooled for rough and finished hollow milling operations on carrier reduction gear pinion forgings for radial type aircraft engines, material of part handled tough alloy steel forgings. Twenty trunnions on part are finished hollow milled on this machine, two trunnions being done at a time, with fixture arranged for ten indexes. Machine is one of a battery of three machines on this particular part, the first machine being used for roughing material between trunnions. The third machine used for finish hollow milling trunnions, and finishing the clearance pads between trunnions.

Features of Baker Cleanline, vertical, hydraulic feed drilling machines:

1. Flexibility for handling other work.
2. Wide range of speed with provision for pick-off gears for various speeds required.
3. Spacer blocks can be furnished of increased height to give increased clearance from end of spindle to top of table.
4. Automatic cycle started thru means of push button station.
5. Ample length of saddle on vertical frame.

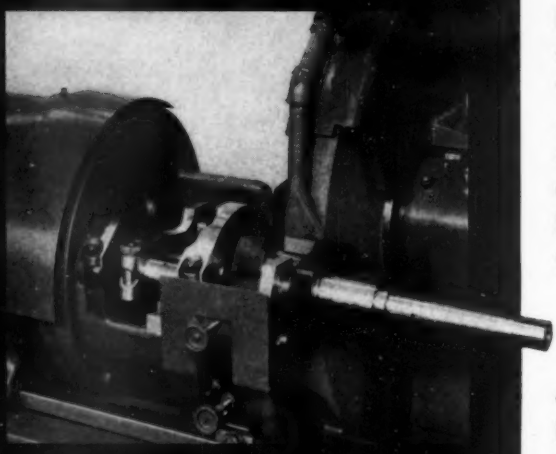
Our Motto Since 1887:
"MACHINES: STURDY AND EFFICIENT, AS FINE AS CAN BE BUILT"

BAKER BROTHERS, INC., TOLEDO, OHIO, U.S.A.

THE ACCEPTED STANDARD

for Grinding the for Radial

used in and



POWERFUL, accurate and a brilliant finisher, this Norton Heavy Duty Hi-Swing Grinder is the generally accepted standard for radial type aviation motor crankshafts, admirably meeting the exacting requirements of a most exacting industry.

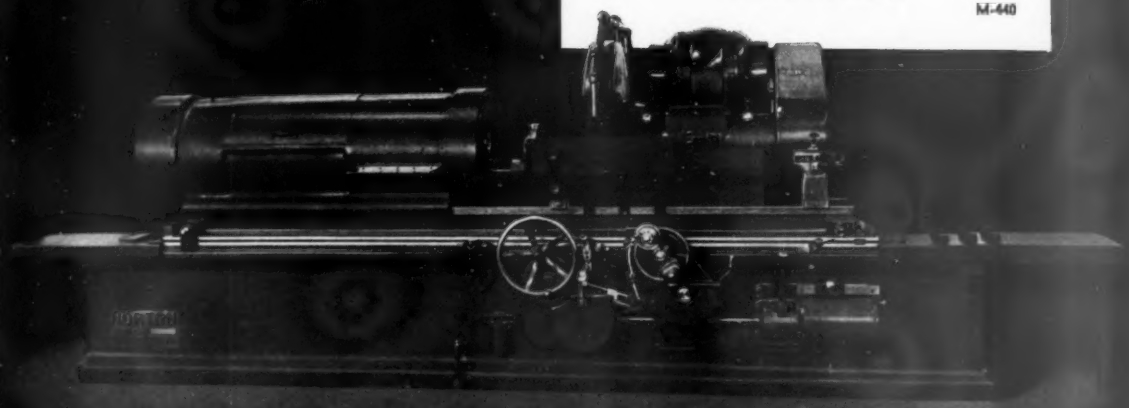
Developed over a period of many years—similar Nortons were grinding shafts of this type long before the advent of our Defense Program—this heavy duty machine is a tried and proven precision tool.

Long the United States standard, our British friends were considerably concerned at first by its size and massiveness. On the basis of performance alone, however, the wisdom of their choice has been demonstrated. There is no finer testimonial than the satisfied customer.

NORTON COMPANY
Worcester, Mass.

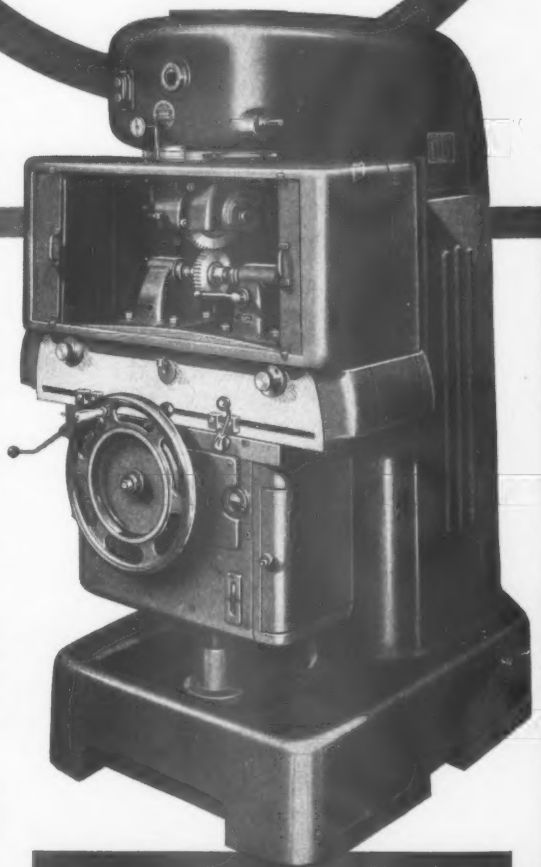
M-440

NORTON
GRINDING MACHINES



THE Elliptoid TOOTH FORM

AN IMPORTANT ADVANCE IN GEAR PRACTICE



Gear tooth contact is one of the most important factors in gear operation, efficiency and service. In a large percentage of cases both gear failure and gear noise are the result of deflections or of slight misalignments of gear axes in either the horizontal or the vertical planes.

This trouble is completely eliminated by the use of the ELLIPTOID tooth form which has been developed by Red Ring engineers for both spur and helical gears.

A horizontal section through an accurately formed conventional tooth has sides that are straight. But with the ELLIPTOID tooth the sides are elliptical, thus making the tooth thicker at the center by .0002" than at the edges or wherever it is desired to locate the contact.

This .0002" is well within customary allowable limits for good gear practice, but by the Red Ring method this can be varied to meet various conditions.

It has been discovered that on the basis of the tooth form design in the transmission gearing of five years ago, it is now possible to reduce gear size, weight and cost for any specified loading by reducing the pitch and making the teeth in the ELLIPTOID form.

The ELLIPTOID form is produced on the Red Ring Gear Finishing Machine as part of the regular gear shaving operation. It requires no extra machine time, no special skill on the part of the operator. Write for descriptive bulletin.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT, MICHIGAN

Engineered Production

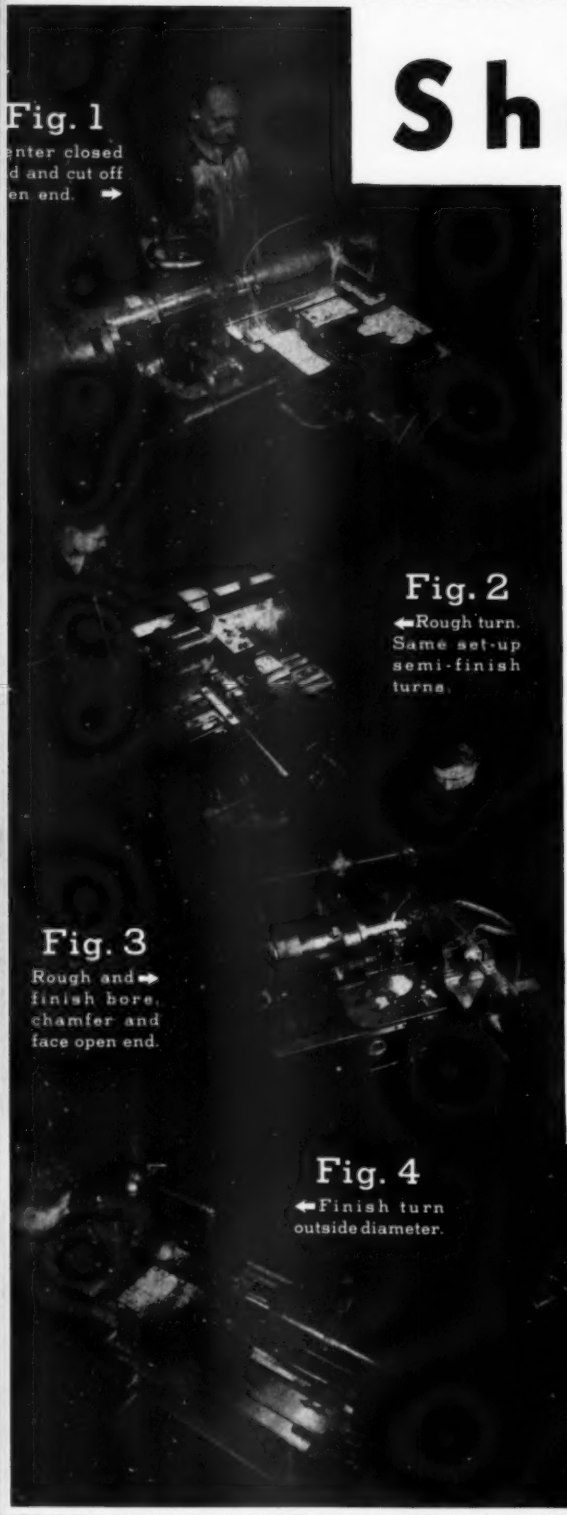


Fig. 1
enter closed
d and cut off
en end. ➡

Fig. 2
⬅Rough turn.
Same set-up
semi-finish
turns.

Fig. 3
Rough and➡
finish bore,
chamfer and
face open end.

Fig. 4
⬅Finish turn
outside diameter.

Fig. 5
⬅Cut off center
boss, face closed
end, form band
and crimping
grooves, knurl.

Fig. 6
Rough and finish turn
and form copper driv-
ing band. ➡

Shell Turning on SUNDSTRAND Automatic Lathes

To manufacturers planning on turning shells ranging from 20 mm. to 155 mm., Sundstrand Engineered Production offers a wealth of experience gained in applying the marvelous production possibilities of Automatic Stub Lathes to shell manufacture. These machines are easily tooled, set up, operated . . . changed over to other munition work, or applied to commercial manufacturing for the civilian population. Some Automatic Stub Lathes are used on a single operation, or group of operations, continually for years. Others are changed from one job to another frequently in the course of a single day. In all types of service Automatic Stub Lathes provide high production at low cost and minimum operating skill.

Typical shell-turning operations on Automatic Stub Lathes are shown in the adjoining illustrations. Complete production data about any of these can be secured quickly on request to the address below, mentioning this publication and the illustration number. Pamphlets containing tooling diagrams, cycles, and production data are available likewise.

Engineered Production . . . Our Engineered Production Department is at your disposal for planning high production easily at low cost on turning and milling operations in the manufacture of shells or other munitions and in commercial products.

SUNDSTRAND MACHINE TOOL CO.
ROCKFORD ILLINOIS U.S.A.

SUNDSTRAND MACHINE TOOL CO.

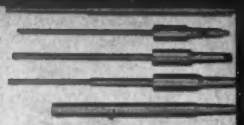
2532 ELEVENTH STREET, ROCKFORD, ILLINOIS, U. S. A.

...ing tool to form-cut groove on motor gear housing.

Large diameter tool for rough and finish boring and chamfering end of crank case.

Slide action tool to cut face after clearing obstruction in casting.

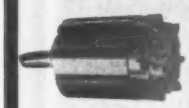
Slide action tool for rough and finish boring, chamfering and facing rear end of crank case.



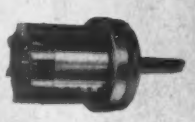
Carboloy tipped boring tools fo... machining bearing seats.

...rse action tool to turn hub for gear clearance.

Slide action tool for finish facing rear end of motor crank case.



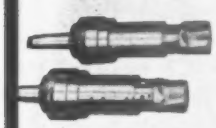
...ti-diameter facing tool equipped ... removable Carboloy tipped blades.



Facing tool with adjustable serrated blades having staggered Carboloy tips.

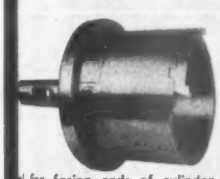
...l equipped with ball bearing ..., micrometer adjustment boring, facing and chamfering bits.

Recessing tool for machining two grooves for packing rings.

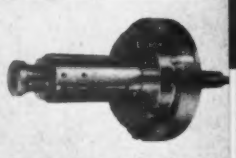


...bination Core Drill and finish ...ing tool for use on engine block.

Hollow Mill equipped with adjustable Carboloy tipped blades.



...l for facing ends of cylinder ...ses after they are mounted in motor block.



Two step facing tool equipped wit... adjustable stop and Carboloy tipped blades.

...ntric facing tool for machining ...le boss thru eccentric opening.

Three chamfering cuts made at same time on airplane motor casting by this automatic tool.

...ssing tool for cutting snap-ring groove in gear assembly.

For machining, at one time, two side of outer bearing in camshaft housing.

...le action tool to rough and finish ...e, chamfer, and face reduction gear housing.

Boring tool with micrometer adjustment for use on distributor gear housing.

Automatic tool for cutting recess and two chamfers in supercharger part.

Recessing tool for cutting double groove in oil line part.

Automatic facing tool for machining internal boss.

PRODUCTION SPEEDS UP *with* Carboloy TIPPED TOOLS

The illustrations show a few of the many High Production Tools designed and built by Scully-Jones & Company for producing aircraft engines. Carboloy tipped cutting edges assure maximum efficiency in performance as well as increased production through greater speeds and feeds.

Our Engineering Staff is ready to assist in solving your production tooling problems.

SCULLY-JONES & CO.

1901 SOUTH ROCKWELL STREET

CHICAGO • ILLINOIS

Bottleneck Breaker!

OSTER

NO. 601 TURRET LATHE

A New **SIMPLIFIED** *Machine*

HOW QUICK DO YOU WANT IT?

The Oster No. 601 bar and chucking machine equipped with hand lever-operated six-position turret. Capacity of automatic chuck: round bar 1⅛-inches, Swing: 14 inches, over bed: 6¾ inches over cross slide.

Crack down on machining bottlenecks! Get going with this new SIMPLIFIED, versatile, easily operated OSTER turret lathe! When can we deliver? Months ahead of more complicated, higher priced machines that demand more highly skilled set-up men and operators.

Varying set-up arrangements and conditions are met rapidly by the hand lever-operated six position turret. Shift from long-run to short-run schedules; change from bar stock and collet chucking to jaw-chucking; keep production moving; *break those bottlenecks!*

You get the No. 601 to meet *YOUR* requirements: with the six-position turret or with plain saddle, arranged for single tool post or other fixture. Also, you can have the No. 601 with WORM drive or DIRECT drive.

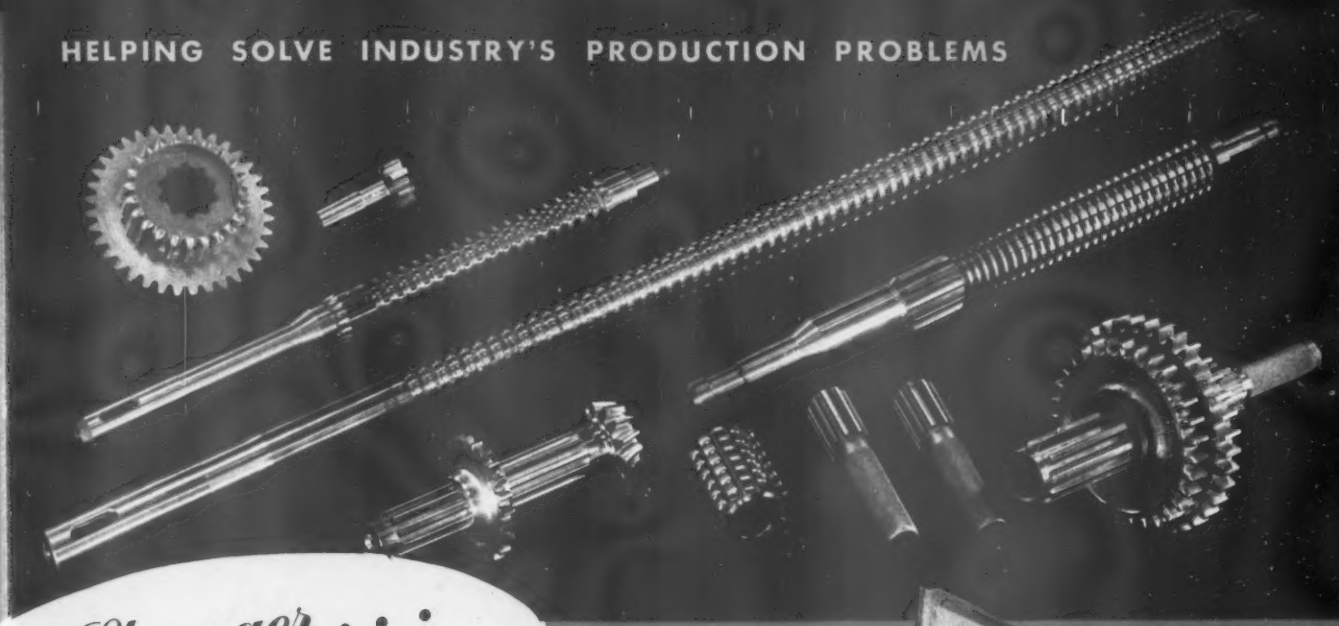
Certainly you want more details before you say "O. K." to this machine. Ask us for Catalog 27-A. It will help *us* to help YOU if you tell us your exact range of job requirements.

THE OSTER MANUFACTURING COMPANY

2063 EAST 61st STREET • CLEVELAND, OHIO • U. S. A.

GET GOING AND KEEP GOING FASTER WITH AN **OSTER**

HELPING SOLVE INDUSTRY'S PRODUCTION PROBLEMS



Stronger . . . closer fitting

INVOLUTE SPLINES

See Pages 179-213 Catalog E

Illinois Engineers developed the first recognized standards for Involute Splines

Previous to the approval of the Involute Spline System by the American Standards Association, Illinois Engineers had developed definite dimensional standards for involute splines. These standards aided in broadening the use of involute splines in preference to straight splines and contributed greatly to the creation of the approved system.

The advantages of the approved Involute Spline System are:

1. Selective fits are possible because the splines are side bearing and fits are made on key thickness.
2. The involute splines have a wider base thickness in both the shaft and fitting; therefore, have a much greater strength.
3. The curved shape of a spline key is longer, resulting in a greater area of sliding surface.
4. There are no outside diameter or root diameter fits.
5. The hobs for involute splines can be manufactured to closer tolerances than hobs for square keys because straight tooth profiles are used.
6. With top grinding, only 19 hobs are required for cutting the 285 standards.

A. Cluster gear with involute spline hole.
B. Shaper cutter for large internal splines.
C. Finishing broach, teeth relieved on sides.
D. Spline broach for starting from round hole.
E. Finishing broach of the progressive type.
F. Transmission gear and shaft assembly with involute spline.
G. Involute spline hob.
H. Gauges for checking involute splines.
I. Tapered spline gauge inserted in cluster gear for checking splines for selective fits.

ILLINITE

HIGH SPEED

PRODUCTION TOOLS

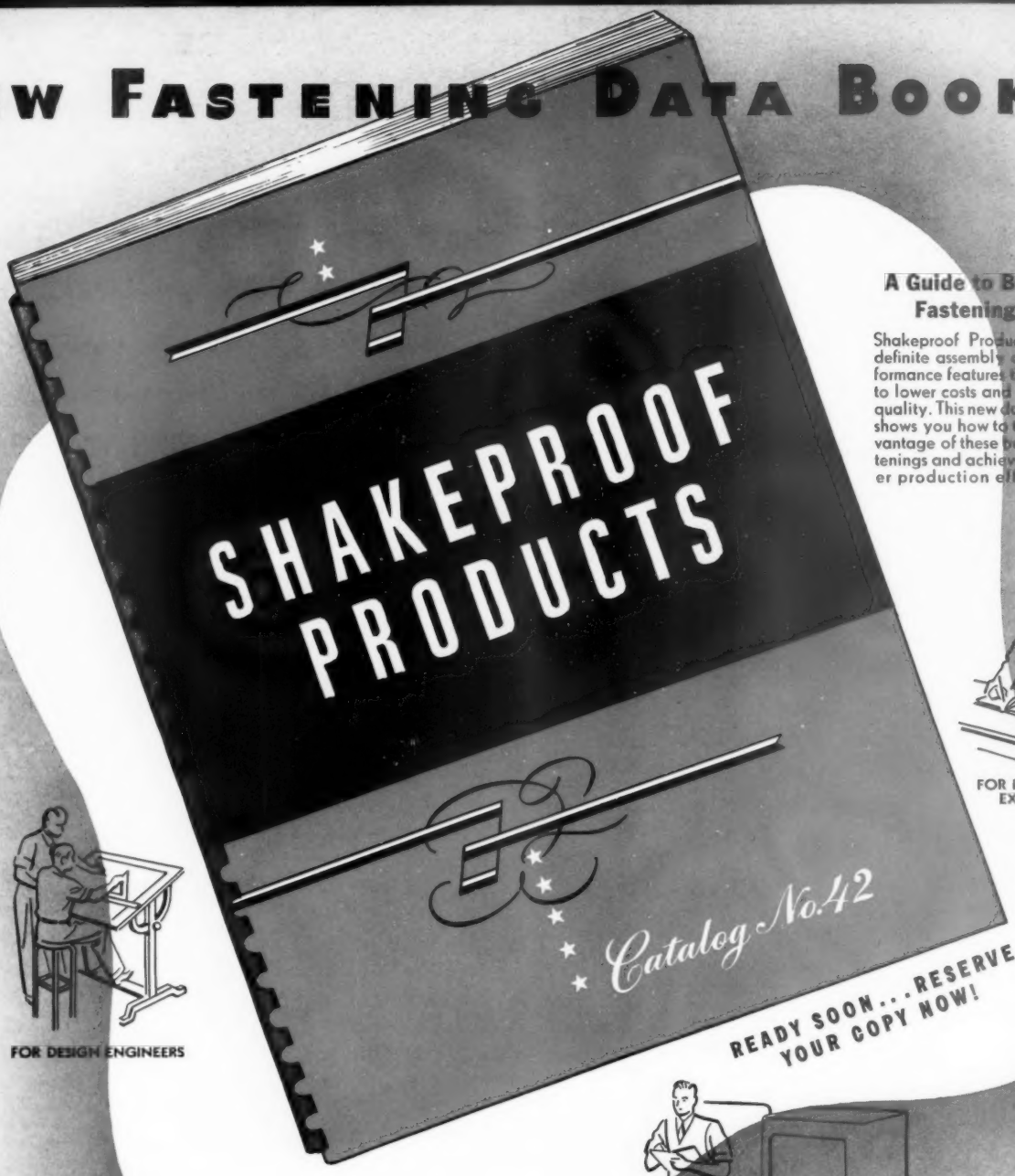
Milling Cutters
Ground Hobs
Broaches
Shaper Cutters
Ground Form Tools
Special Tools
Die Filing Machines
Gear Measuring Machines

ILLINOIS TOOL WORKS

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

2501 N. KEELER AVENUE, CHICAGO, ILLINOIS • IN CANADA: CANADA ILLINOIS TOOLS, LTD., TORONTO, ONTARIO

NEW FASTENING DATA BOOK!



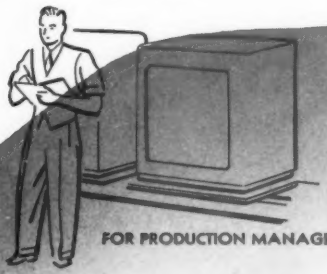
A Guide to Better Fastenings!

Shakeproof Products offer definite assembly and performance features that help to lower costs and improve quality. This new data book shows you how to take advantage of these better fastenings and achieve greater production efficiency.

FOR PURCHASING EXECUTIVES

FOR DESIGN ENGINEERS

READY SOON... RESERVE YOUR COPY NOW!



FOR PRODUCTION MANAGERS

THE new Shakeproof Catalog No. 42 provides a complete and detailed presentation of all Shakeproof Products. Its one hundred and forty pages are filled with information and illustrations of special interest for design engineers, production managers and purchasing executives. Each Shakeproof product is described in detail and full engineering data is given. In addition, application suggestions and other technical material helpful in securing greater fastening efficiency has been included. Reserve your copy of this outstanding fastening data book by mailing a request on your company's stationery—copies will be distributed as soon as available.

SHAKEPROOF inc.
fastening Headquarters

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS
2501 North Keeler Avenue Chicago, Illinois

Plants at Chicago and Elgin, Illinois
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario
Foreign Licensees: Barber and Colman, Ltd., Brooklands, Manchester, England
Carr Fastener Co. of Australia, Ltd., Royal Park, South Australia

SEMS Fastener Units • Lock Washers • Locking and Plain Terminals • Thread-Cutting Screws • Locking Screws • Spring Washers • Radio and Instrument Gears • Engineered Shakeproof Parts • Special Stampings

Increasing Production with Present Equipment at the Timken-Detroit Axle Company

Vascoloy RAMET

Tantalum-Tungsten Carbide Tools

• •

AS NEAR AS YOUR TELEPHONE

• • •

Call the nearest of these DISTRICT OFFICES:

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HARTFORD	32-5197
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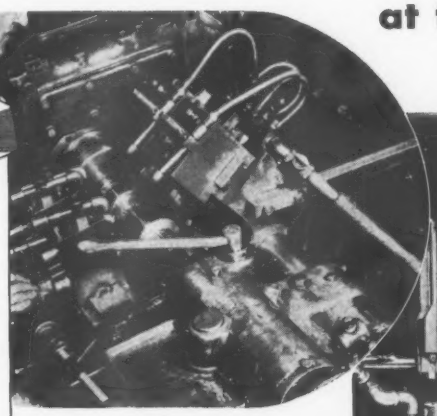
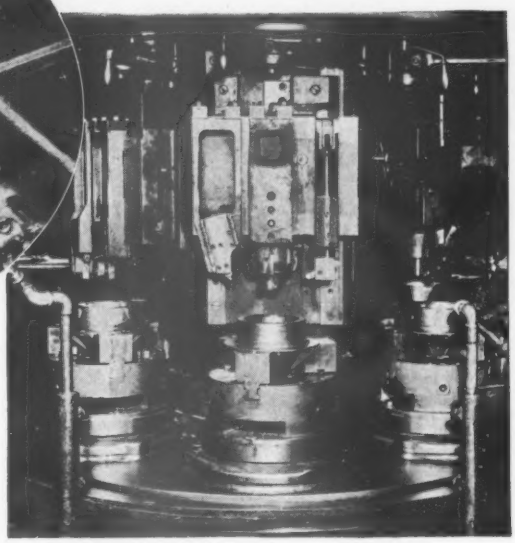
NEW YORK AREA	Worth 2-3923
PHILADELPHIA	Rittenhouse 8360
PITTSBURGH	Atlantic 9699
PROVIDENCE	Dexter 1271
ST. LOUIS	Newstead 3110
SYRACUSE	3-0334



⬆ Differential side gear blanks of S. A. E. 4620 are turned two at a time on this Fay Automatic Lathe equipped with five Vascoloy-Ramet Tools. Cutting speed 216 s. f. m. with .037 in. feed per revolution.

Cutting speeds on tough steel parts range from 175 to 400 ft. per min. with depth of cut from ⅛" to as high as ⅜". Besides the greater production with these high speeds, there is the additional saving in time due to many more pieces per tool grind.



⬆ Bullard Mult-Au-Matics are used for finishing forgings and cast steel parts, such as ring gear blanks. Practically all steel parts are machined with Vascoloy-Ramet tools.

Like many other defense manufacturers, Timken-Detroit Axle Company is making present machines produce more by revision of conventional tooling practices. Much of this equipment has been speeded up by the use of Vascoloy-Ramet Tantalum-Tungsten Carbide cutting tools.

Timken-Detroit Axle Company has had considerable experience with machining tough steel parts, and has conclusively demonstrated to their own satisfaction the increased production, longer tool life, and the more pieces per grind possible by using the proper grade and style of tools.

Our engineering and research departments can be of great help in getting you started right on similar increased production possibilities. We are glad to cooperate with you toward the most efficient utilization of these tools.

Where you cannot use cemented carbide, use

TANTUNG "G"

the new Miracle Cutting Metal (not a steel, not a cemented carbide) . . . most efficient at speeds about double those of high speed steel. Available in two styles and 65 standard sizes. Ask for information.

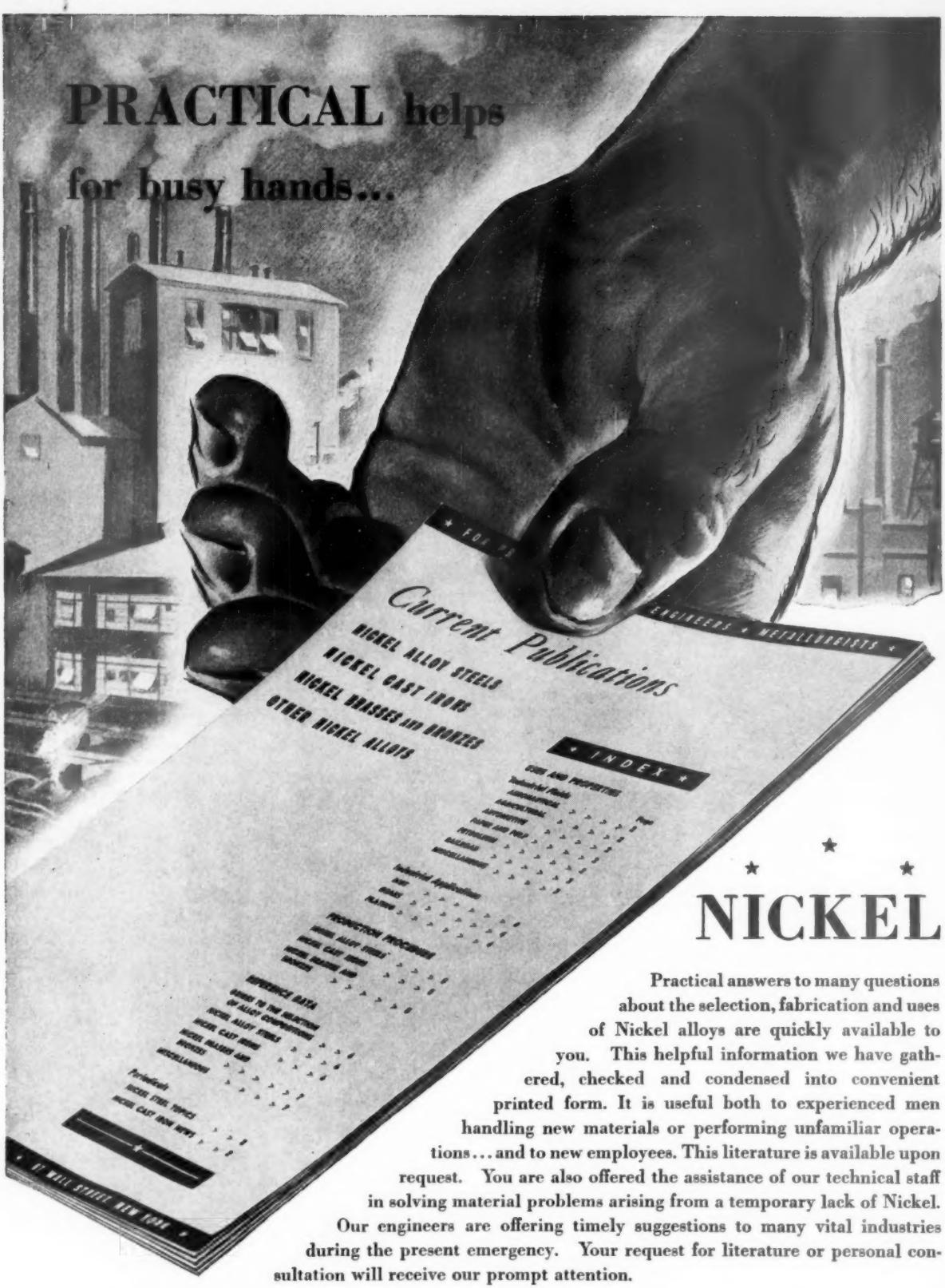
VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

AUTHORIZED AGENTS IN PRINCIPAL CITIES

In Canada: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE TOOLS



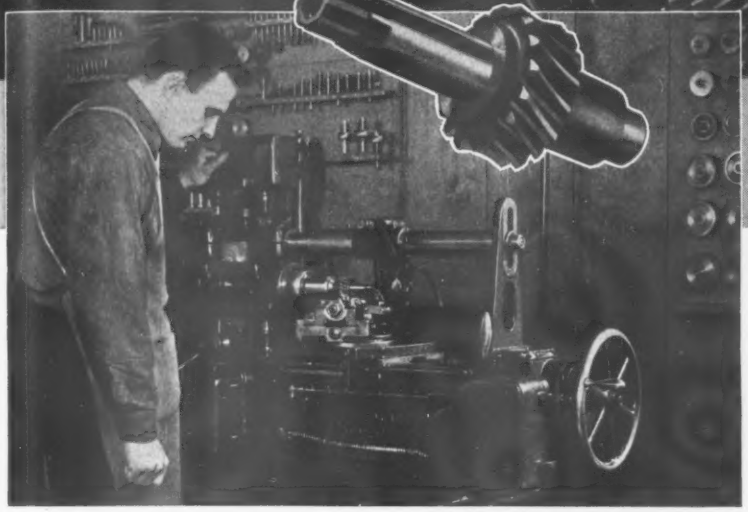
★ ★ ★

NICKEL

Practical answers to many questions about the selection, fabrication and uses of Nickel alloys are quickly available to you. This helpful information we have gathered, checked and condensed into convenient printed form. It is useful both to experienced men handling new materials or performing unfamiliar operations... and to new employees. This literature is available upon request. You are also offered the assistance of our technical staff in solving material problems arising from a temporary lack of Nickel. Our engineers are offering timely suggestions to many vital industries during the present emergency. Your request for literature or personal consultation will receive our prompt attention.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

Barber-Colman No. 3 Hobs This Bronze Worm Wheel In 4 Minutes



B-C Hob Produced 7800 Pieces In 65 Sharpenings

A standard Barber-Colman No. 3 Hobbing Machine equipped with a Vertical Feed Attachment hobs Precision Worm Gears in 4 minutes at Skilsaw, Inc., Chicago, Illinois.

The worm gears are made of tough bronze and Barber-Colman Ground Topping Hobs are used. High accuracy and finish are maintained by frequent sharpenings, and total hob life averages 65 sharpenings for a total of 7800 pieces.

Barber-Colman Complete Hobbing Service solves many manufacturing problems of accuracy, cost, or output by applying the versatile hobbing process. Very often this results in freeing other type machines and their skilled operators needed for other essential work.

When you have a production problem on gears, worms or similar forms; consult experienced Barber-Colman Engineers without obligation, and see what B-C Hobbing can do. Just write.

Brief Operation Data

Part — Bronze Worm Wheel mounted on shaft.

Hobbing Machine — Barber-Colman Standard No. 3, with Vertical Feed Attachment.

Operation — Hobbing a bronze worm wheel having 16 teeth, 11 pitch, 1.900″ O.D., 1.592″ pitch dia., 1.774″ throat dia., ¾″ face, 20° pressure angle, and 24° helix angle. Work is fed vertically down to the hob, with hob swivel slide stationary.

Work-Holding — A collet chuck on the spindle and a half-center at the outer end support the worm wheel shaft.

Feed per rev. of work — 0.004″.

Hob Speed — 230 r.p.m.

Accuracy — Tooth form and indexing of finished worm wheel is held within 0.0002″.

Production Time — 4 minutes per piece, floor-to-floor.

Hob — Barber-Colman Single-thread Ground Topping Hob, with 2″ dia. and length, straight bore, 14 gashes.

No. of Settings — 3.

Pieces per Grind — 120.

Total Hob Life — 65 grinds or 7800 pieces.

The well known motor-driven saws and drills made by Skilsaw, Inc., Chicago, Illinois, require exceptionally strong, quiet speed-reduction drives. B-C Hobs and Hobbing Machines provide economical high production of accurate gears for this exacting service.

● Write for Bulletin F-812, fully describing the B-C No. 3 Standard Hobbing Machine which handles work up to 5″ dia. and 12 pitch. Vertical Feed Attachment, used on the above job, is covered separately in Bulletin F-1410, which also describes other special attachments.

BARBER B-C COLMAN

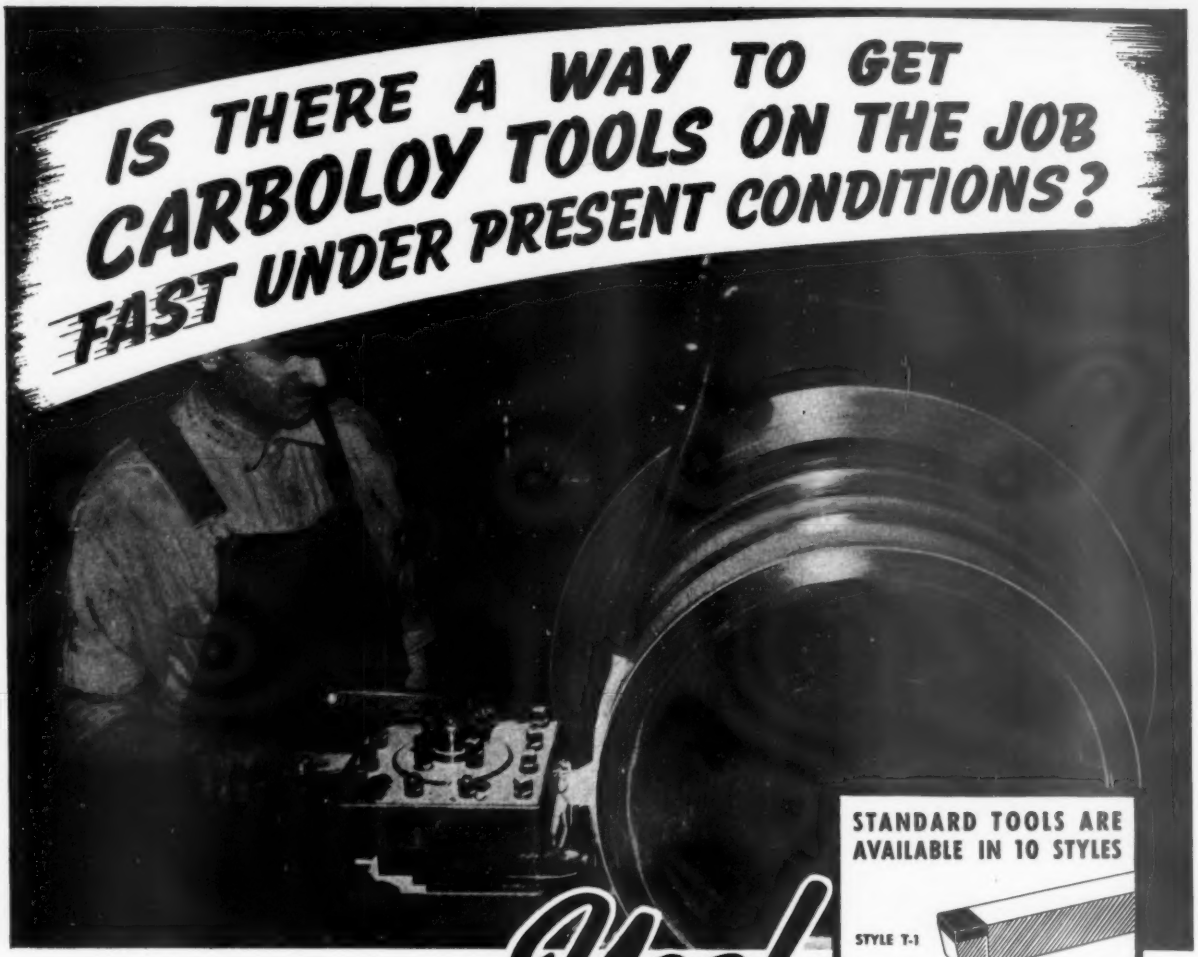
PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

General Offices and Plant 213 Loomis St., Rockford, Illinois, U. S. A.

IS THERE A WAY TO GET CARBOLOY TOOLS ON THE JOB FAST UNDER PRESENT CONDITIONS?



FALK CORP. SAYS *Yes!* "HERE'S HOW". . . . . .

When Falk Corporation, Milwaukee, needs specially shaped carbide tools *fast*—it's a matter of *minutes*—and the job is done!

Take the above job, for example: Machining reduction gear blanks for the main drive of Uncle Sam's destroyers. 14 "specially" designed carbide tools required. Falk "makes" these specials—ready to go—in 135 minutes!

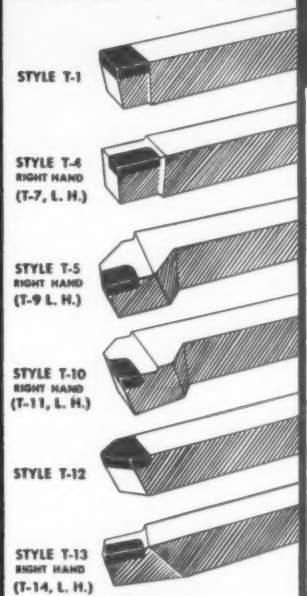
Here's how Falk saves weeks on not just this one job—but on 86% of their carbide tool requirements:

From the 10 styles of Carboloy Standard-Stock Tools—now being manufactured in "mass production quantities" for "universal" use on turning, facing, boring jobs—Falk has selected 9 styles to maintain in stock in their tool room. When specials are needed, Falk adapts the "standards" by quickly grinding the shape desired. Usually no more than a 10-minute job per tool—and as easy to do as the average regrinding of dull tools.

A 12-page booklet tells the story. Free, upon request.

CARBOLOY COMPANY INC.
11145 E. 8 MILE STREET • DETROIT, MICHIGAN
Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Worcester, Mass.
Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

STANDARD TOOLS ARE AVAILABLE IN 10 STYLES



CARBOLOY Reg. U.S. Pat. Off. **STANDARD TOOLS & TIPS**

"You ALWAYS Get Standards FASTER Than 'Specials'"

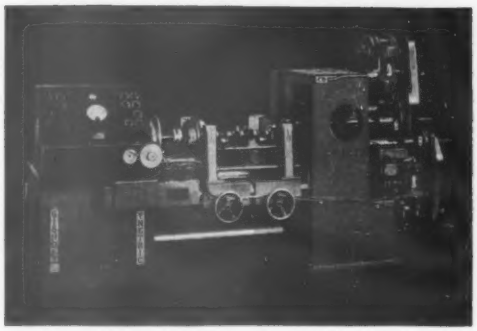
FREE 12-PAGE BOOKLET

"Tune-In" ON Trouble ... BEFORE IT HAPPENS !

DYNETRIC BALANCING MACHINES

Those faint, almost imperceptible "throbs" are the telltale evidence of destructive forces that will attack any high speed rotating part. But they can't hide from this super-sensitive machine which detects unbalance vibrations as small as .000025". It picks up these danger signals, amplifies them. And in a few seconds, unbalance is located and measured, permitting quick and simple correction to eliminate the hazard of vibration, noise and excessive wear.

Now that accurate balancing has been made so simple and economical to attain, through the use of Gisholt Dynetric Balancing Machines, hundreds of motor-driven products will benefit through smoother, quieter, and more efficient operation. If you use high speed rotating parts in your products, it will pay you to investigate.



Gisholt Balancing Machines are built in various sizes and types to answer practically all requirements. Their operation is discussed in an interesting new bulletin, profusely illustrated. Your copy will be sent on request.

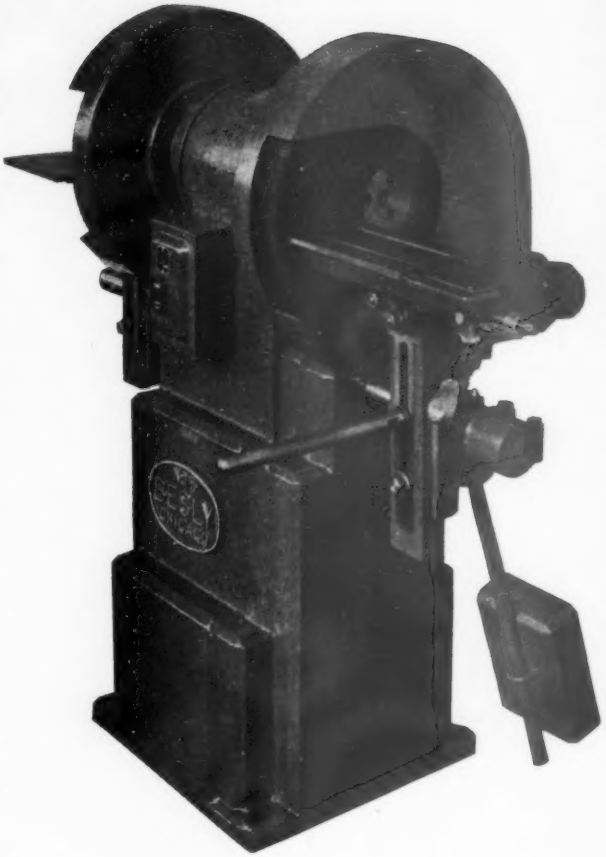
Look Ahead... Keep Ahead...
With Gisholt Improvements

GISHOLT

GISHOLT MACHINE COMPANY • 1229 E. Washington Ave., Madison, Wis.

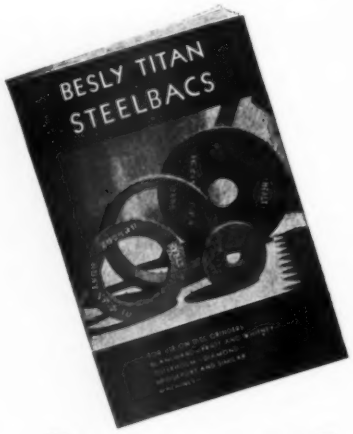
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

The NUMBER FIVE BESLY GRINDER



YOU cannot equal a Besly Grinder for speed, low labor costs and all around efficiency on work for which it is intended.

• Here is a Direct Connected Motor Driven Besly Grinder with sturdy 3 H.P. Motor. The spindle mounted in high-grade ball bearings carries 18" Besly Titan Steelbacs—Bolted-On Abrasive Discs. Equipped with the famous Besly Geared Lever Feed Table it will effect real economies in your tool room and on the erecting floor. Just the machine for light manufacturing. Equip your plant with one of these modern Disc Grinders and enjoy the benefits of Besly Grinding.



Write for your copy of Booklet on Besly Titan Steelbacs.

• If you operate a grinding machine employing the side of a wheel, learn what the Besly Titan Steelbac will do for you. These Bolted-On Abrasive Wheels have replaced the older type in most progressive shops.

★

CHARLES H. BESLY AND COMPANY

118-124 NORTH CLINTON STREET ★ CHICAGO, ILLINOIS

MORE CHIPS PER MINUTE

with CIRCLE "C" SUPER HIGH SPEED STEEL

No matter what the unit of time—minute, hour, or day — the *true measure* of a cutting tool's effectiveness can be judged by the *net* amount of metal it removes in a given period.

CIRCLE "C" Cutting Tools are constantly demonstrating their capacity to work at 25% faster machine speeds, with greatly increased cuts and feeds and far fewer shutdowns for re-grinds on the hard and heat-treated alloys used in production of *shells, aeroplane engines and other armament.* Thus, this high cobalt-tungsten Super High Speed Steel, distinguished in a peacetime economy for its prodigious chip removing ability, now occupies a unique place among steels in Defense industries. *Although a tungsten steel it actually conserves tungsten through greater production as compared with other tungsten high speed steels.*

FIRTH-STERLING
STEEL COMPANY

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McKEESPORT, PA.
BRANCH WAREHOUSES:
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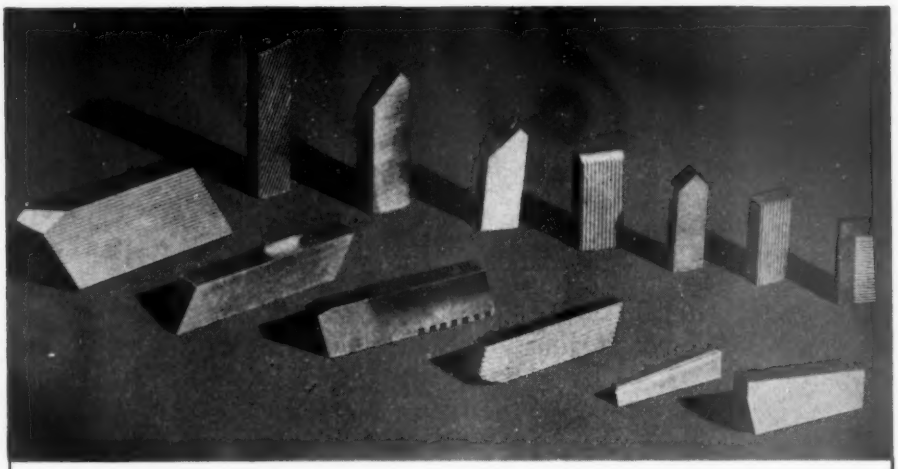
LOS ANGELES DAYTON
CLEVELAND DETROIT

For Economical Production
USE HAYNES STELLITE TOOLS



Haynes Stellite Special Milling Cutter Blades

Shown above is a group of Haynes Stellite special milling cutter blades, typical of the many Haynes Stellite special tools which are available. Other special tools which are regularly cast and finish ground to users' specifications include blades for boring and reaming, form tools, spot facers, welded tip tools, counterbores, reamers, and brazed-in-blade milling cutters.

Wide Range of Tool Applications

Haynes Stellite alloy tools are economical because these uniform, dependable tools operate at high speeds with long life between grinds —at a low cost per piece machined. These tools are used for machining practically all machinable materials, except chilled cast iron and manganese steel. Specific operations include turning, facing, boring, reaming, milling, grooving, cutting off, forming, spot facing, core drilling, and counterboring.

Standard Tools Stocked for Immediate Delivery

1. **Solid Tool Bits**—Wide range of square and flat sizes.
2. **Welded Tip Tools**—Large variety of styles and sizes.
3. **Milling Cutter Blades**—Various types for many cutter bodies.

* * *

Write or phone the district office nearest you for complete information on standard and special Haynes Stellite tools.

HAYNES STELLITE
TRADE MARK

Red hard, wear-resisting alloys of cobalt, chromium and tungsten

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company.

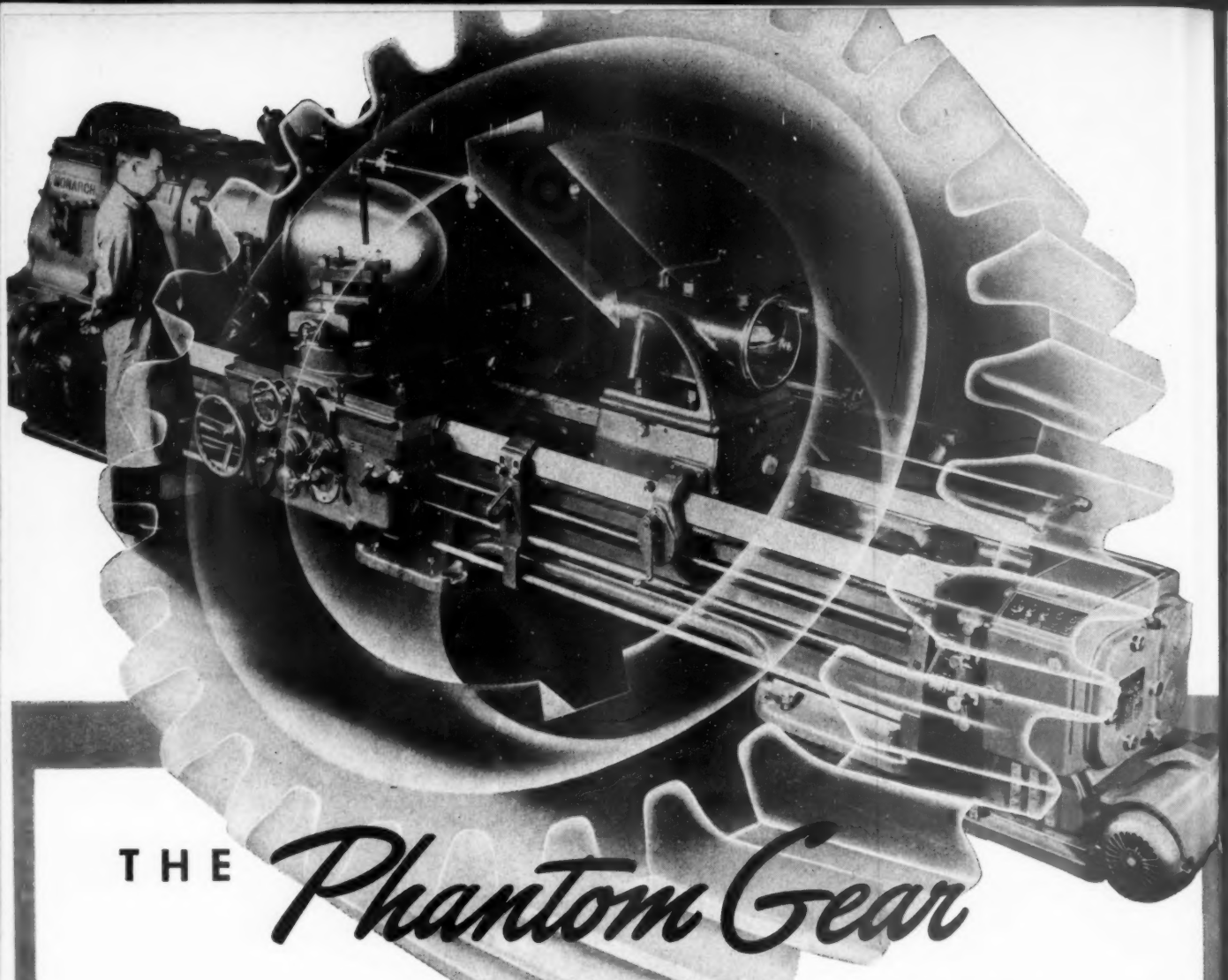
200 JIGGLES PER MINUTE STOPPED IN THEIR TRACKS

WHAT you see above is the main drive on a Heald Bore-Matic. Turn on the power and the whole unit gently vibrates at the rate of approximately 1200 times a minute. This is a lot of jiggling, but it stops right there. Heald engineers saw to that, for vibration must be entirely eliminated for best results in precision boring. First they quarantined this worst of vibration offenders — the drive motor, the clutch and brake drive and the hydraulic pump — by isolating these units low down at the rear of the base. Then they mounted the entire unit on vibration dampeners so that practically zero vibration escapes to the base. To make doubly sure they included multiple "V" belt drive from the motor, and flexible tubing between pump and hydraulic system to insure smooth transmission of power. And that is not all. Bore-Matics, too, have the clutch and brake unit also mounted on vibration dampeners . . . multiple "V" belt drive to boring heads . . . the base itself is extremely massive, rigid, to absorb any stray vibration. All these are reasons why Heald Bore-Matics are able to produce "tenth" precision consistently . . . and are A-1 reasons why Heald Bore-Matics should be seriously considered for every precision boring job.

NO VIBRATION HERE!

Outstanding characteristic of Heald Bore-Matics is the practically complete absence of vibration in the boring spindles. Machine elements that might cause undesirable spindle flutter are entirely isolated from the spindles, as explained at the left. Result is that on Heald Bore-Matics you can get extremely good accuracy and finish consistently, and maximum life from tools, too.

THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A.



THE *Phantom Gear* JOINS THE NAVY!

TURNING TIME on some vital parts for Navy use has been cut from 21 hours to 3½ hours . . . six times as fast . . . with Monarch automatic sizing controls. Automatic sizing, applied to Monarch lathes, provides automatic production on such work as any combination of steps, taper and contour turning, boring or facing.

Back of such Monarch contributions to lathe utility is that attitude which we call "*The Phantom Gear.*" Made up of initiative, open-mindedness and courage to try new ideas, "*The Phantom Gear*" inspires management and men to increase the usefulness and efficiency of Monarch lathes.

* * *

This vitalizing force, now enlisted in National Defense, has doubled our production in 1941 over 1940, without any sacrifice of quality. When peacetime returns, with its demand for more goods for more people, at lower cost, Monarch will be ready with still more useful lathes.

THE MONARCH MACHINE TOOL COMPANY . . . SIDNEY • OHIO

MONARCH LATHES

COVER THE TURNING FIELD

Monarch's March of Progress

Monarch initiative has made the lathe a more useful tool by the introduction of such improvements as:

Automatic sizing for all size lathes

Helical geared headstock

Anti-friction bearing mountings for all rotating parts

Flanged spindle nose

Automatic force feed lubrication

Anti-friction bearing taper attachment

Flame-Hardened beds

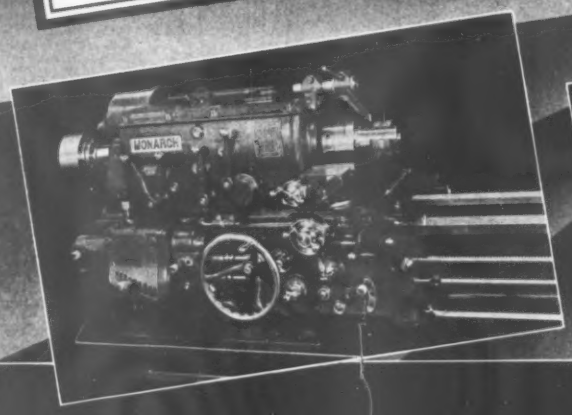
Even as the emergency presses us to more and more production, new refinements in design and shop practice are continuously at work to maintain Monarch leadership.

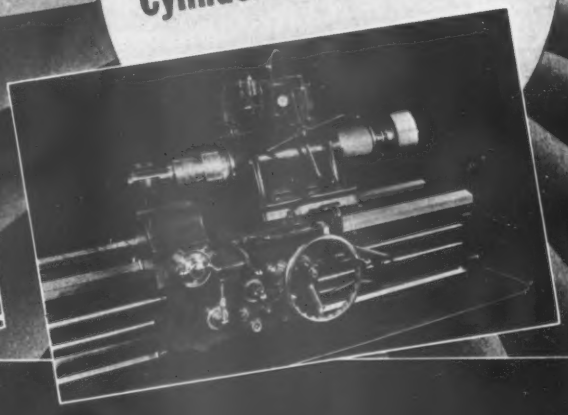
"LOGAN" AIR EQUIPMENT AS APPLIED TO 20" x 120" MONARCH LATHE

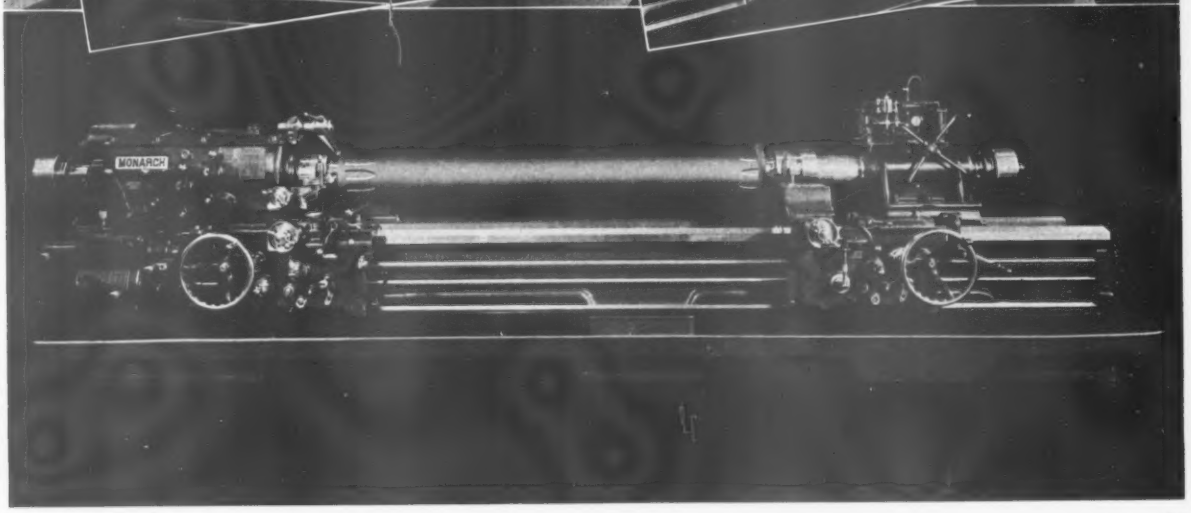
This 16-speed Model "M" Monarch Lathe is designed to machine parts ranging from 14" to 120" length. The headstock and tailstock are equipped with duplicate "LOGAN" Air Equipment and tooled to face both flanges simultaneously. Controlled by a single air valve, one operator keeps the lathe in constant production. "LOGAN" Expanding Mandrels, with interchangeable jaws, to handle the entire range of sizes, support the work. Model R Revolving Type "LOGAN" Air Cylinders operate the "LOGAN" Mandrels. This heavy duty Air Equipment assures positive gripping and rigid support of work. "LOGAN" Representatives and "LOGAN" engineers will be glad to make recommendations on your problems.

LOGANSPORT MACHINE, INCORPORATED
902 Payson Road LOGANSPORT, INDIANA
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories

Headstock (left) and tailstock of Monarch Lathe with duplicate "LOGAN" Air Cylinders and Mandrels







NO BLACKOUT!

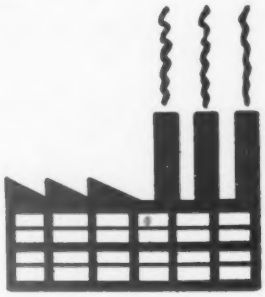
Let there be no blackout on American spirit! Again, as we have for 27 years, we extend you these familiar greetings . . .

MERRY XMAS—HAPPY '42

May the New Year hold in store for our friends from coast to coast a full measure of health and happiness.

ECLIPSE COUNTERBORE COMPANY
DETROIT · MICHIGAN

WHICH SIDE OF THE FENCE WILL YOU BE ON?



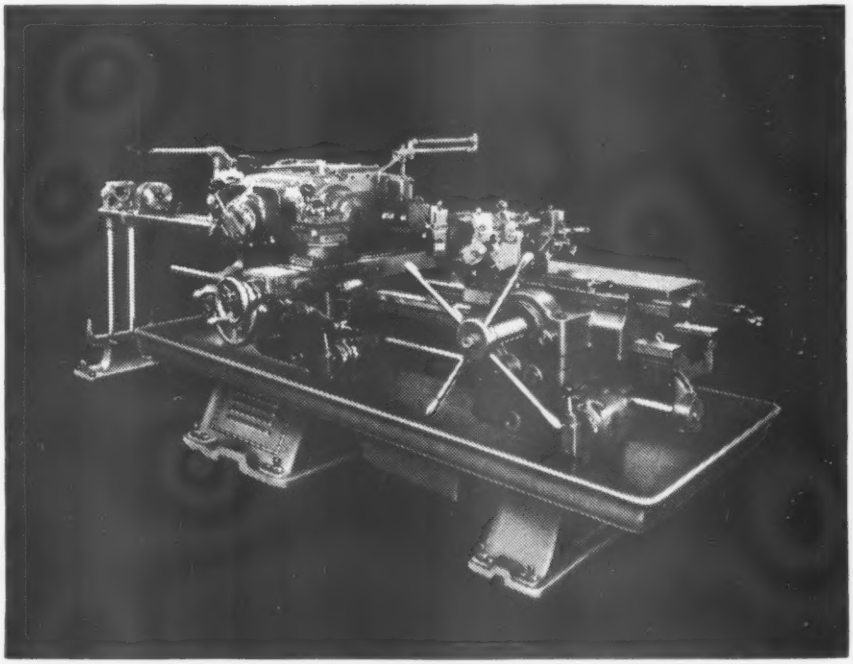
TODAY

The versatility, precision, power and productiveness of Jones & Lamson equipment will enable you to make outstanding contributions to national defense.

TOMORROW

Post-war competition will relentlessly eliminate any plant whose equipment cannot easily turn to low cost production for peace-time demand. Wise purchases of Jones & Lamson equipment, made today, will leave you on the right side of the fence.

No. 3 Jones & Lamson Ram Type Universal Turret Lathe with standard bar equipment



PROFIT PRODUCING MACHINE TOOLS

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers.

JONES & LAMSON MACHINE CO.

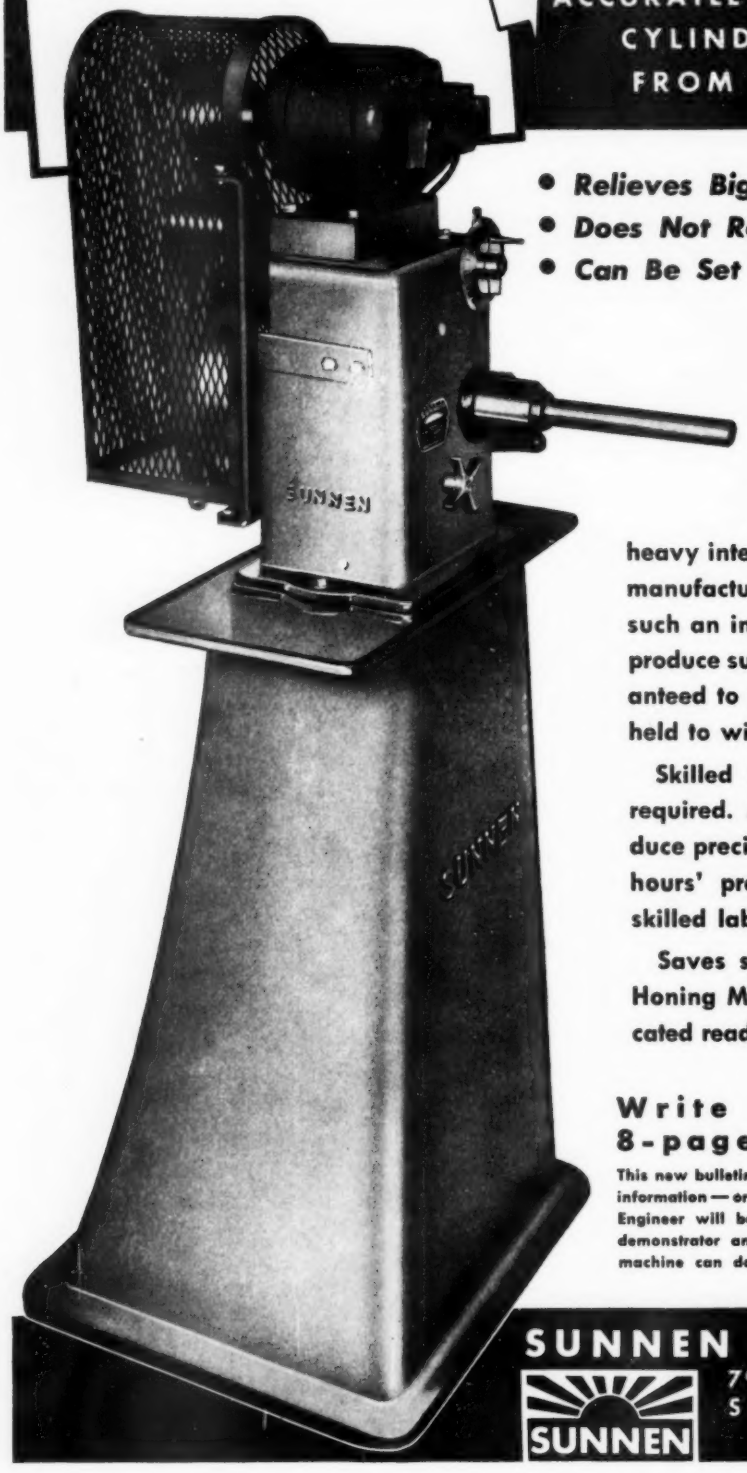
SPRINGFIELD, VERMONT, U. S. A.

HERE'S HELP ON YOUR

DEFENSE PRODUCTION

SUNNEN *PRECISION* HONING MACHINE

ACCURATELY FINISHES INTERNAL CYLINDRICAL SURFACES FROM .185″ to 2.400″



- ***Relieves Big Internal Grinders!***
- ***Does Not Require Skilled Labor!***
- ***Can Be Set Up In Less Than a Minute!***

BY USING the Sunnen Precision Honing Machine to accurately grind and finish internal cylindrical surfaces from .185″ to 2.400″, many defense manufacturers have been able to release heavy internal grinders for other work. These manufacturers have been amazed to find that such an inexpensive piece of equipment can produce such accurate work. Accuracy is guaranteed to within .0001″, and has often been held to within .000025″ in production work.

Skilled or experienced operators are not required. Any intelligent workman can produce precision workmanship with only a few hours' practice. You can shift your highly skilled labor to other jobs.

Saves set-up time — the Sunnen Precision Honing Machine can be set up and work located ready for honing in less than one minute.

Write for FREE 8-page Bulletin

This new bulletin will give you complete information — or if you prefer, a Sales Engineer will be glad to call with his demonstrator and show you what this machine can do for you on your job.

SUNNEN PRODUCTS CO.
7932 MANCHESTER AVENUE
ST. LOUIS, MISSOURI
Canadian Factory — Chatham, Ontario

1942 ... A GOOD YEAR TO BUY *Precision* MACHINES!

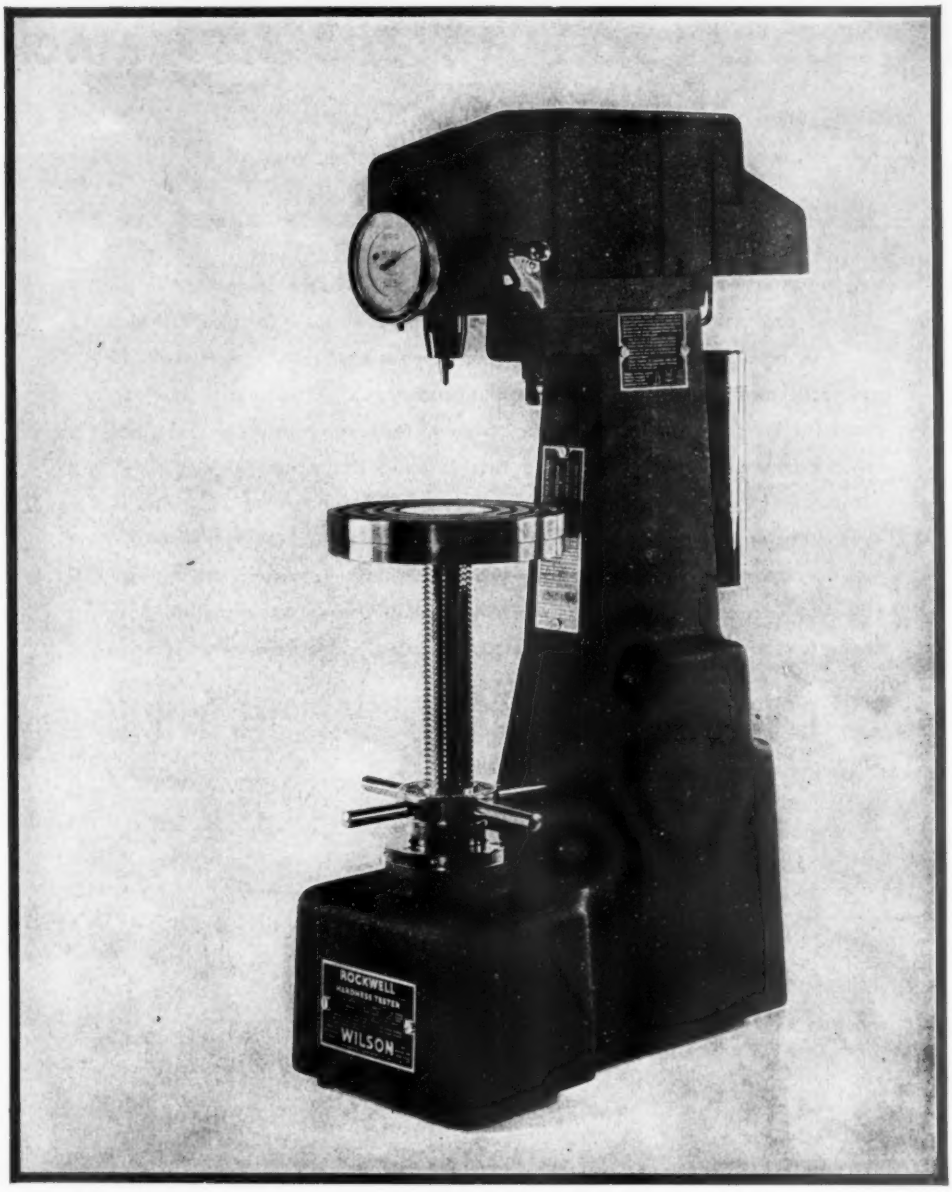
New requirements indicate that production still has a long way to go —that 1942 will be a year of much greater need for *the right kind of machines* if the vast quantities of defense materials now demanded are to be realized without sacrifice of accuracy. . . . Wherever production calls for precision boring, turning, facing, lapping, and accurately finished threaded work, a machine tool bearing the name of Ex-Cell-O, pioneer in precision machining, is *exactly the right equipment*. . . . This is why standard Ex-Cell-O Precision Machines are in the forefront throughout American industry—why many prime and sub-contractors, getting into full swing on defense work, are selecting Ex-Cell-O precision machine tools as an assurance of maximum production, accuracy, and economy in 1942.

EX-CELL-O CORPORATION • DETROIT, MICH.

PRECISIO
THREAD GRIN
ING—AN EX-CELL
DEVELOPMEN
THAT HAS ESTA
LISHED NEW HIG
STANDARDS OF A
CURACY, SPEE
AND ECONOM
FOR PRODUCTIO
THREADED WOR

XLO

Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS



"ROCKWELL"
HARDNESS TESTER

Model 4-PR

Our Care and Your Care

While it is true that we, like all manufacturers of machines, have unusual problems in our production, we wish to assure each and every prospective customer that our hardness testers are the equal of any machines we have ever built with regard to both accuracy and durability.

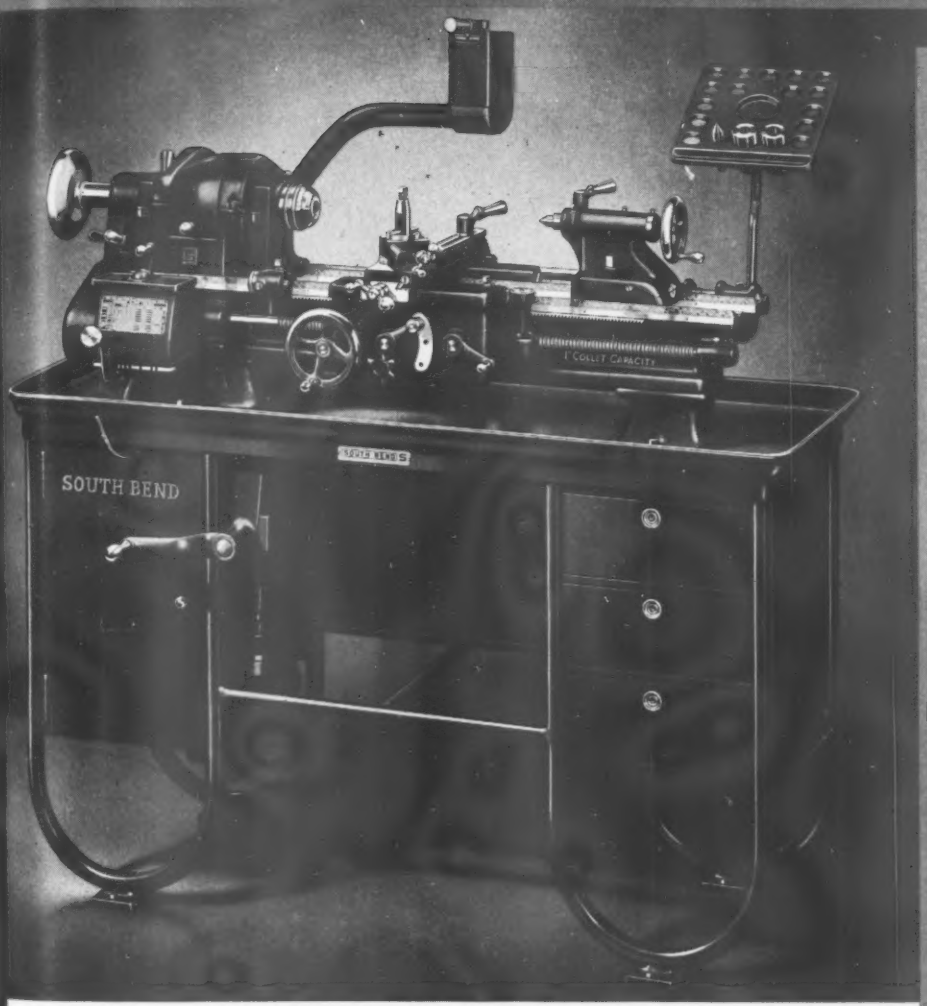
It is, perhaps, not to be expected that they will be used quite as carefully as in normal times, but do not move them into positions where they are more than necessarily exposed to grit, moist or corrosive atmosphere, or other tough conditions. Remember that, though rugged, they are micrometric measuring instruments and abuse impairs their value. Even the strongest and healthiest man cannot afford to eat ground glass.

380 CONCORD AVENUE
NEW YORK

WILSON
MECHANICAL INSTRUMENT CO., INC.

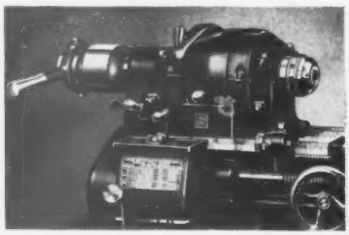
PRECISION

PLUS SPEED AND VERSATILITY



South Bend 10″ Swing 1″ Collet Capacity Precision Bench Lathe

Hand wheel type draw-in collet chuck for precision tool room work. Maximum collet capacity 1″.



Hand lever draw-in collet chuck for rapid production operations. Maximum collet capacity 1″.

Above. Headstock end of lathe showing Quick Change Gear Box. ★

Left. Index chart showing threads and feeds available through Gear Box.

10-INCH SOUTH BEND QUICK CHANGE GEAR LATHE

SLIDING GEAR	TOP LEVER	THREADS PER INCH—FEEDS IN THOUSANDTHS								
IN	LEFT	4 .0836	4½ .0743	5 .0669	5½ .0608	5¾ .0582	6 .0557	6½ .0515	7 .0478	
	CENTER	8 .0418	9 .0372	10 .0334	11 .0304	11½ .0291	12 .0279	13 .0257	14 .0239	
	RIGHT	16 .0209	18 .0186	20 .0167	22 .0152	23 .0145	24 .0139	26 .0129	28 .0119	
OUT	LEFT	32 .0104	36 .0093	40 .0084	44 .0076	46 .0073	48 .0070	52 .0064	56 .0060	
	CENTER	64 .0052	72 .0046	80 .0042	88 .0038	92 .0036	96 .0035	104 .0032	112 .0030	
	RIGHT	128 .0026	144 .0023	160 .0021	176 .0019	184 .0018	192 .0018	208 .0015	224 .0015	

AUTOMATIC CROSS FEED EQUALS ⅓ TIMES LONGITUDINAL FEED

PRECISION is the first essential in modern metal working industries. But speed is necessary also, for the efficient use of fast-cutting carbide tools—and versatility, to reduce set-up time to minimum. Precision, speed, and versatility are three of the many qualities responsible for the popularity of South Bend Lathes.

The 10″ Swing, 1″ Collet Capacity Precision Bench Lathe shown here is engineered for the most exacting classes of close-tolerance machine work. Direct belt drive to the carefully balanced spindle assembly provides a series of smooth, vibration-free speeds ranging from 50 to 1357 R.P.M. The full quick change gear makes any of 48 different threads and 48 different feeds instantly available.

This combination of precision, speed and versatility assures an efficient output on tool room or manufacturing work—makes this lathe ideal for defense programs demanding top speed production. South Bend Lathes are made in 9″, 10″, 13″, 14½″, and 16″ swing, manufacturing or toolroom type, individual motor drive. Write for catalog and name of nearest dealer.

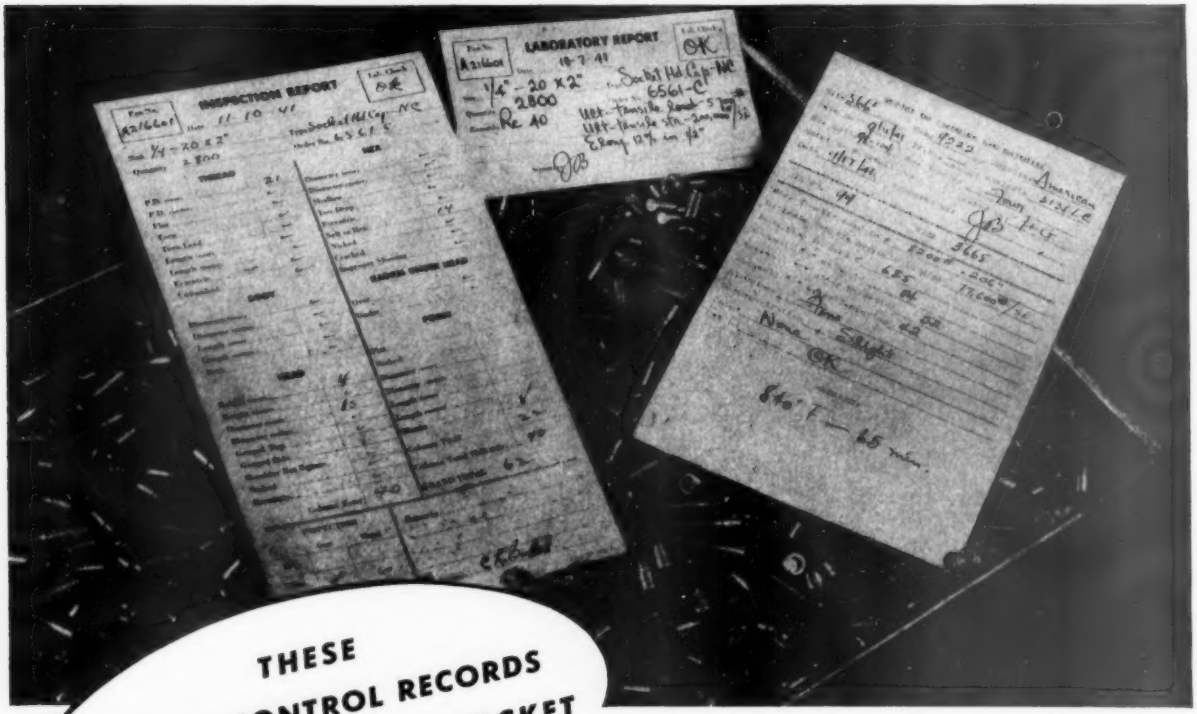
SOUTH BEND LATHE WORKS

927 EAST MADISON STREET, SOUTH BEND, INDIANA, U.S.A.

LATHE BUILDERS SINCE 1906

"Watchmen"

that Protect Your Defense Assemblies!



THESE QUALITY-CONTROL RECORDS PREVENT "DOUBTFUL" SOCKET SCREWS THAT CAUSE DELAYS AND REJECTS

From careful analysis of the raw material, through every step in production, *each lot* of Parker-Kalon Socket Screws is guarded by these "watchmen" . . . the quality-control records you see here. One reports on the Parker-Kalon Laboratory's analysis of the special alloy steel . . . another is the Lab's point-by-point okay of all physical characteristics of the finished screws. A third record covers an extensive series of critical inspections of dimensions and other details.

The uniformly high standard of quality which MUST RESULT from such rigid control is ample reason why industry specifies PARKER-KALON for important defense assemblies. Besides, it costs no more to have this protection against "doubtful screws" . . . screws that *look* all right but some of which fail to *work* right. Parker-Kalon Corp., 190-198 Varick Street, New York.

PARKER-KALON

Quality-Controlled

SOCKET SCREWS

Give the Green Light . to Defense Assemblies

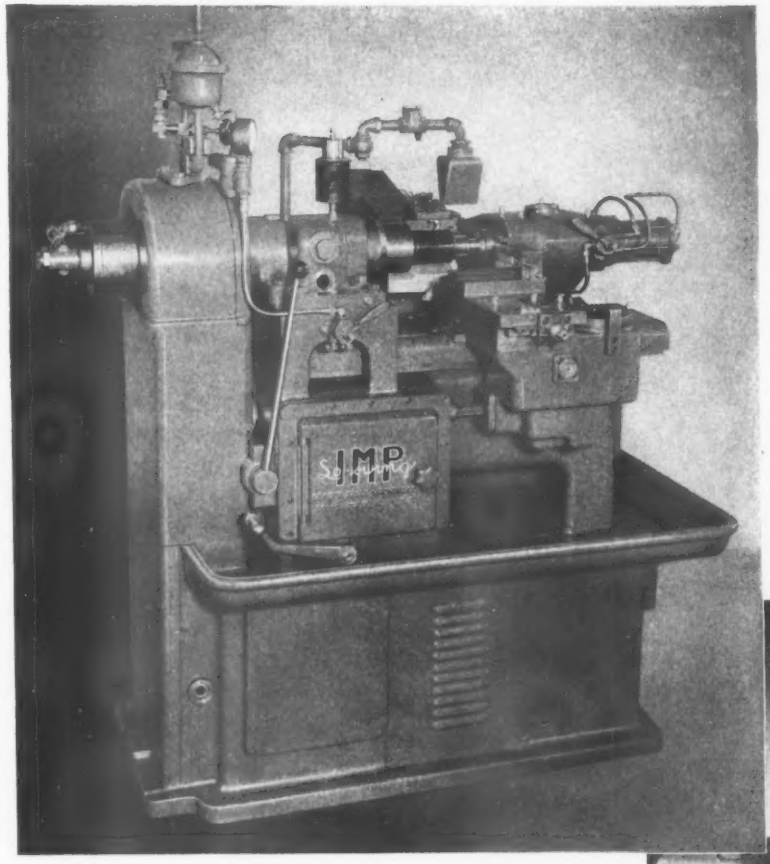
Quality-Controlled

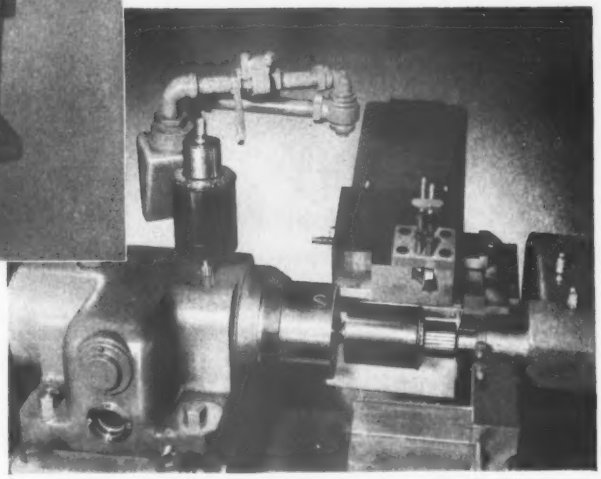
16-point test and inspection routine covers: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth and centricality; Class 3 Fit Threads; Clean-starting Threads.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing IMP LATHE AUTOMATICALLY TURNS AND FACES COMMUTATORS TO HIGH ACCURACY AND FINISH REQUIREMENTS





Close-up showing detail of template-controlled facing tool on Back Attachment.

PROBLEM: To automatically turn and face electric starter commutators; to provide a fine finish and maintain extremely close tolerances.

SOLUTION: The Lo-swing IMP Lathe with special equipment was selected for this job primarily because of inherent design features. Its spindle bearings are designed to permit the very high spindle speeds necessary for turning copper alloy, and the method of fitting the carriage to the bed, with flat and "V" ways, assures unusual turning accuracy.

The work is held and driven from one of the ball bearing seats of the shaft with an air-operated collet chuck. The tailstock end is supported on the other bearing seat by a collet chuck mounted in a revolving spindle which is operated through the air-controlled tailstock spindle quill. This method of holding and driving the rotor from the ball bearing seats assures the close concentricity which is required between the bearing seats and the O. D. of the commutator. The operation consists of turning the O. D. of the commutator, the facing of the angular shoulder (which is part of the commutator) and the chamfering of the shoulder. It should be noted that the 6° angle is faced with a template-operated tool block in order to obtain a very smooth finish, free from all chatter marks.

LIPE "PATHWAYS to PROGRESS"

A DEVELOPMENT OF LIPE ENGINEERING AND MECHANICAL SKILL.

1910 Model, Lipe Gear Chamfering Machine.

Lipe engineering and skilled craftsmanship have long records of brilliant achievement behind them. More than 30 years ago it was the Lipe Gear Chamfering Machine that paved the way for the selective, sliding-gear transmission used in automobiles and for the mass-production method of manufacturing them. Lipe Chamfering Machines still take top rank in gear manufacture.

For Today's Speed and TOMORROW'S ECONOMY . . .

- ★ **Super-powered for faster cutting**
- ★ **Super-rigid for lower spoilage**

LIPE FULLY AUTOMATIC Carbo-Matic LATHE

Higher turning speeds . . . fewer turning operations . . . longer tool wear . . . and less spoilage! Those are the advantages you get from the Lipe Fully Hydraulic Carbo-Matic Lathe. It meets today's rearmament demand for faster production. It will meet tomorrow's competitive demand for lower cost production.

Super-powered for fast turning of the toughest alloys, it is super-rigid to end tool chatter, to reduce tool breakage and wear, and to eliminate the deflection that causes out-of-round out-of-true and other spoilage. In a single operation, it turns to tolerances ordinarily produced by rough grinding.

The operator merely loads and unloads. All the rest is automatic. Hydraulic control governs spindle clutch, chuck and collet closer, longitudinal and cross feeds, and tailstock quill. Swing over carriage 8″, between centers 30″. Write for delivery dates now.

W. C. LIPE, INC., SYRACUSE, N. Y.

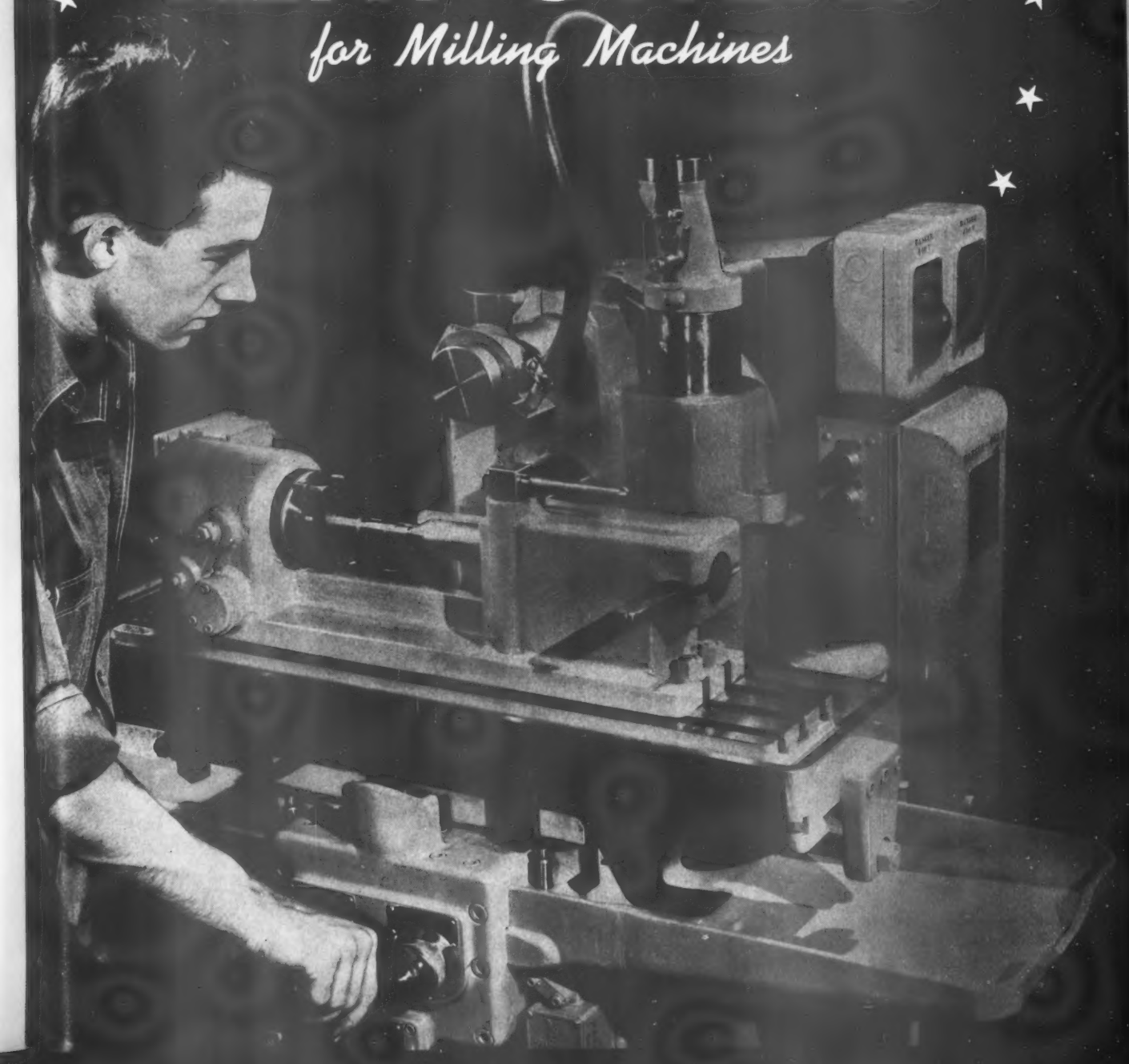
Take Your Defense Jobs Out Of The Tool Room

Kent-Owens solid bed Milling Machines have the guts and rigidity for the exacting requirements of defense work. For example, the indexing fixture shown is entirely automatic and produces spline parts accurately on a production basis. *Defense jobs must be taken out of the tool room and put on a production basis.* Write for latest bulletins. Kent-Owens Machine Company, Toledo, Ohio.

Call on

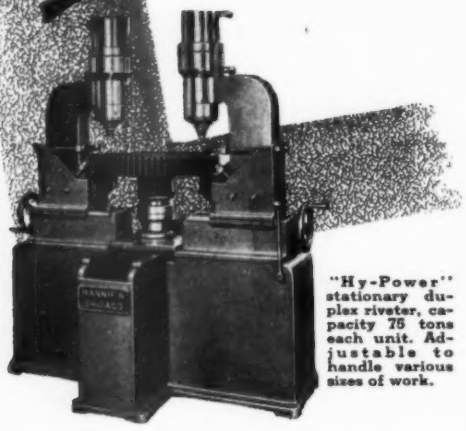
KENT-OWENS

for Milling Machines



BIG and Fast

"Hy-Power" portable riveter, capacity 100 tons, reach 17 in., stroke 5 in.



"Hy-Power" stationary duplex riveter, capacity 75 tons each unit. Adjustable to handle various sizes of work.

.... to deliver the riveting performance that matches today's production needs

Hannifin "Hy-Power" Hydraulic Riveters deliver the fast, easily handled riveting that keeps pace with the increasing speed of modern production operations. The 100 ton capacity portable riveter and the duplex 75 ton stationary unit are recent examples of Hannifin "Hy-Power" equipment built for specific needs of armament production. The "Hy-Power" hydraulic operation, originated and perfected by Hannifin, combines the high speed, automatically completed riveting cycle with ease of operation and control, and simple handling of work, to deliver sustained riveting production. The push button controlled "Hy-Power" cycle includes: 1. Rapid advance stroke, 2. Automatic high pressure working stroke, 3. Automatic reversal at maximum pressure, 4. Rapid return stroke. Reversal at maximum pressure governed by work resistance contributes to better, more uniform riveting, and provides automatic compensation for variations in rivet length within the capacity of the unit.

Write for Bulletin No. 53 with complete data on Hannifin "Hy-Power" hydraulic equipment for riveting, punching, pressing, press-fit assembly, forming, multiple unit punching and riveting, and similar work.

★ ★ ★ ★ ★ ★ ★

While National Defense needs are taking most of our greatly enlarged plant capacity, we will continue every possible assistance to users of Hannifin production tool equipment. Standard types of Hannifin hydraulic and pneumatic equipment may be modified to meet individual needs, avoiding delays due to special design. Hannifin engineers will give you specific recommendations.

HANNIFIN MANUFACTURING COMPANY

621-631 South Kolmar Avenue • Chicago

Detroit Representative: R. A. BEAN
Hayward Building, 4829 Woodward Avenue
Telephone Columbia 4949

HANNIFIN "hy-power" RIVETERS · PUNCHES · PRESSES

THE TOOL ENGINEER

T.M. Reg. U.S. Pat. Office

Volume X, Number 12

Tool Engineering Hits A New High

By FRANK W. CURTIS

President, American Society of Tool Engineers

THE American Society of Tool Engineers will celebrate its 10th Anniversary next March. At that time we hope to be more than 10,000 strong and to have 50 Chapters located in the largest industrial areas from coast to coast. This growth, without any doubt, represents the most outstanding of its kind ever recorded by any technical organization.

Although the youngest of National Societies, the A.S.T.E. is one of the most prominent engineering bodies serving our Defense Program. On the shoulders of its members rests the gigantic task of a rapid change-over from the manufacture of one kind of product to another of an entirely different type, with mass output of extreme importance.

Being responsible for practically every phase of manufacturing from raw materials to finished products, the Tool Engineer is, without doubt, the key man of industry, because it is to him that management relies for the manufacture of a more accurate product, made at a lower cost, and in larger quantities than ever before.

Our U. S. Armament Program today is far in advance of the days of World War I. In fact, we are at present fully 12 months ahead of 1917-18 production. This achievement is due largely to management's realization of what Tool Engineering means to industry by giving the Tool Engineer more recognition for the things he is so capable of performing.

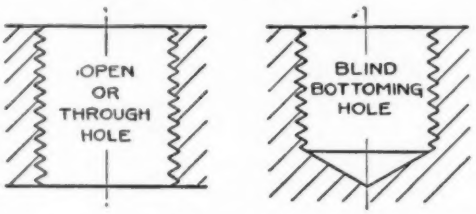
The successful turnover of any plant management depends on product design, costs, output and sales, each of which has a direct relation to Tool Engineering. The product of the designing engineer is dependent for success on the ability of the Tool Engineer to build it, hence co-ordination between them is fundamentally important. Costs, quite naturally, interest the Tool Engineer because where a stipulated expense is predetermined, it is to the Tool Engineer that we look for solution. Production economies and the rate of output are, as we all know, the chief concern of the Tool Engineer because through his ingenuity, he can devise methods that will bear a direct relation with profits. As for sales, no product is successful unless it is dependable, uniform and accurately made, for which we look to the Tool Engineer for his creations to control limits of accuracy and to design equipment to assure interchangeability.

Just as the Science of Tool Engineering has made possible so many luxuries in the time of peace, so is it giving us armaments now so that peace will last. Tool Engineers can be proud of what they have already contributed to aid our Defense Program. While progress has been rapid there still remains much to be done and it will be necessary to contribute more than ever before in order to hasten Victory.

Hole Hints FOR TAPPERS

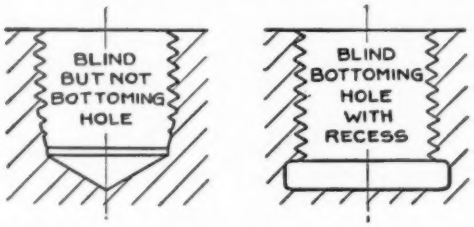
SLOW production, rejected parts and broken taps, are often due to poor preparation of holes for tapping operations. Here are some points which will help you to prevent costly losses.

Always keep in mind that good clean drilling and a reasonable size maintenance are keys to better, faster tapping and with less strain on the tap and less power consumption.



For open or "through" holes in steel, use "*Gun*" or Plug Taps; stick to Plug Taps for gray cast iron and non-malleables; for cast iron containing steel, use "*Gun*" Taps. For blind or bottoming holes, use a Bottoming Tap if the full length of the hole is to be threaded. Always be sure the drill chips are removed from the bottom of the blind hole before you start to tap.

A 100% thread depth requires 3 times the power necessary to tap a 75% thread, but is only 5% stronger. A nut with 50% thread depth will break its bolt before the thread will strip. Good manufacturing practice should provide a depth of thread not less than 62% to 75% (depending on the size) and not more than 83⅓% of the basic thread depth. Remember these facts and you will not make your drilled holes too small.



The tougher and harder the material, or the deeper the tapped hole, the smaller the thread depth you can safely adopt.

Punched holes in thin sheet metal tend to cause taps to "load" and break. See that punched holes are not too small. Same with cored or forged holes in casting or forging. It pays to drill them.

As a guide to the most practicable drill size for all threads, consult any standard tap drill chart. We will gladly send you one on request.

This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

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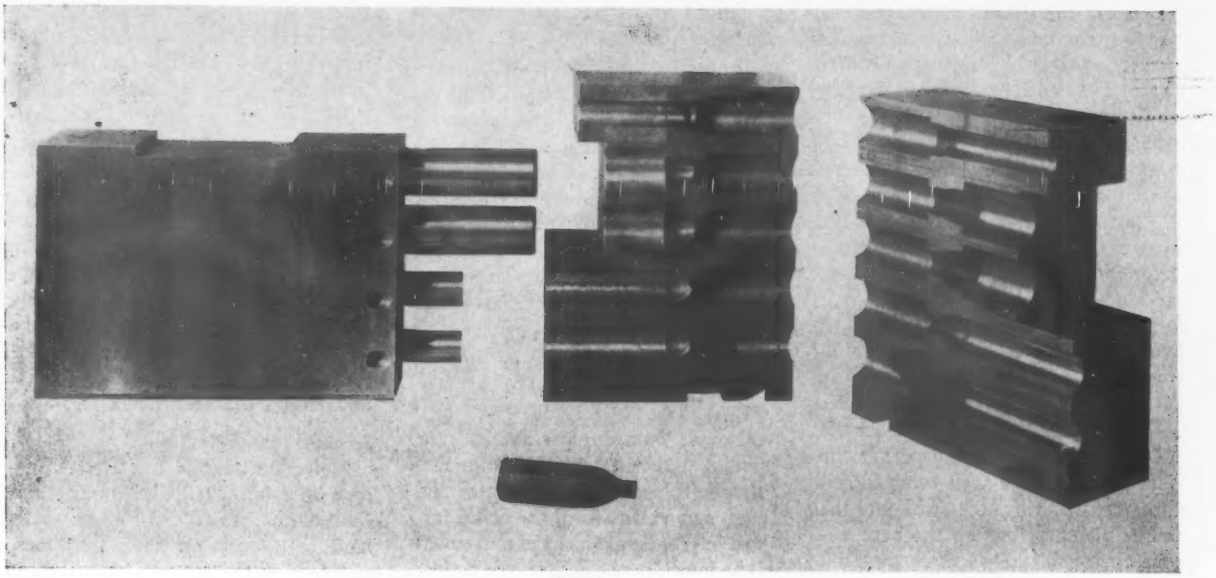


Figure 1
37 mm shell dies. The critical point for armor piercing shell was five operations.

Forging Shell by the Upset Process

Recent progress in the methods of forging shell now makes its possible to finish forge the cavities by use of the upset process.

By H. N. ANDERSON

Hill Acme Company
Cleveland

IN the last year and a half, numerous installations have been made for the forging of shells by the upset method. These installations have now been operating for a considerable period of time and from them we are now able to give you the benefit of this production experience.

The contribution of the shop executives in the various forge plants using this process has indeed been a large one, both in assisting in developing the dies through the experience gained in production, as well as determining the proper steels and their heat-treatment permitting longest tool and die life. Another item is the development of handling and conveying equipment which further permits increased production by keeping the idle machine time down to a minimum.

Given a good forging machine and a well-designed set of dies, the job is only partially done as uniform and thorough heating is imperative. This, together with the proper cooling and lubricating of the tools, as well as suitable handling equipment, requires a technique necessary to obtain an efficient and high production.

Shell Range

The range of shells that we recommend forging by this method runs from the 37 m/m armor piercing shell to the 105 m/m high explosive shell.

Considering first the explosive type of shell or those with an accurate forged cavity eliminating the necessity of finishing, would point out the advantages accruing to production by forging them by the upset method, as follows:

First: Concentricity can be closely controlled — provided, however, that the material is heated uniformly throughout. If heating is not uniform, there is a tendency for the punch to drift away from the point where the temperatures are low to a point where the temperatures of the metal are higher—in other words, it goes to the point of the least resistance, which, of course, is the point where there is the greatest amount of heat in the metal with the resultant greatest plasticity.

Second: The lengths of the shells are uniform and can be controlled by the upset method. This is not true of the pierce and draw method where long skirts of variable length are characteristic, the lengths of these skirts varying in degree with the eccentricity.

Third: Inasmuch as a high degree

of concentricity can be maintained, the outside finish allowance can be greatly reduced, especially where there is a contract for both forging and machining by one contractor, which eliminates the necessity of following the minimum dimensions on the Ordnance departments' prints.

Fourth: With the upset process, the boat-tail, which is the general characteristic of most of the shells we have referred to, can be forged.

Fifth: The thickness of the shell at the base can be reduced to a minimum. In this connection, with the pierce and draw method this base has to be heavy enough to counteract the effort of the ring die and permit the punch to carry the shell being forged through the ring die without the punch piercing through the base, requiring considerable excess material at this point.

Material Savings

Sixth: The savings in material accruing to the elimination of the long skirts, the excess finish on the outside diameter, the forging of the boat-tail and the thickness of the base of the shell, are very large in percentage. As an illustration, the 105 m/m shell forged by the upset process and finished by the contractor doing the forging and taking advantage of all the benefits as regards material, will weigh from 36½ to 38 lbs.—in contrast with shells made by the pierce and draw method which may weigh a maximum of 59.9 lbs. according to ordnance department prints. 105 m/m shells made by the upset method to minimum dimensions of ordnance department prints will weigh approximately 42 lbs.

Seventh: The additional investment in equipment, labor, cutting tools and overhead on same to remove this excess material is a further saving accruing to the upset process. In this connection, pretty extravagant production claims are made for forging by other methods. Even if these could be supported, careful consideration should be given to the savings I have enumerated which, together with the minimum rejections, will more than offset the higher forging productions claimed for other processes.

Eighth: With the upset method, the piercing punches merely drift the metal open to an enlarged diameter and there is no extrusion of the metal forward in the die against the movement of the punch in the opposite direction. This eliminates any flow of the metal laterally in the die and increases greatly the life of punches and dies. The pressure on the punch is also greatly reduced due to the elimination of any tendency to extrude the metal laterally.

The time element of the punch in the work is only a fraction of a second, reducing heat absorption by the punches to a minimum, which is in contrast with slow moving presses on both the piercing and drawing operation with several seconds of contact under pressure and the punches may absorb enough heat to show color.

The ordnance department's forging drawings of shells are generally broad enough in their scope to permit the shells being forged by any method and tolerances are such that they do not take in the advantages accruing to the upset process. This is especially true in the allowance for finish on the outside diameters, the skirts, the boat-tail and the thickness of the base.

We would suggest a set of shell forging drawings for all shells made by the upset method, with practical tolerances defined by the practical men in forge plants making shells by the upset process together with the forging machine manufacturers, should be considered by the ordnance department. On one or two sizes of shell, I understand this has been done.

Armor Piercing Shell

Referring back to the 37 m/m armor piercing shell, we understand that quite a number of these shells have been made on screw machines, which would seem to be the economical method as regards production. However, we believe that the benefits accruing to the nose end of the shell through the working and forging of the metal at this point by the upset method, permitting greater piercing characteristics, is such that the Ordnance Department prefers shells made in this manner.

Figure 1 illustrates this size of shell made in a five-operation die. One-inch diameter stock is used. The first operation is a necking or squeezing operation on the nose end. The second operation continues this squeezing of the nose end, as well as gathering the stock in a coning tool. The third operation gathers additional stock through a coning operation, as well as further squeezing the nose end. The fourth operation again squeezes the nose end, upsetting same to the correct diameter. The fifth operation shears the shell from the rod. Production averages about 250 per hour.

In the designing of dies, taking this type of shell for instance, a number of factors enter in. First, the number of operations: it is always desirable to reduce the number of operations to a minimum as this, of course, contributes to a greater production. On the other hand, too few operations result in shorter die life per number of forgings made, together with a greater amount of maintenance on dies as well as additional down time on the machine for changing them. There is a critical point between too few and too many operations that is determined largely from practice and experience.

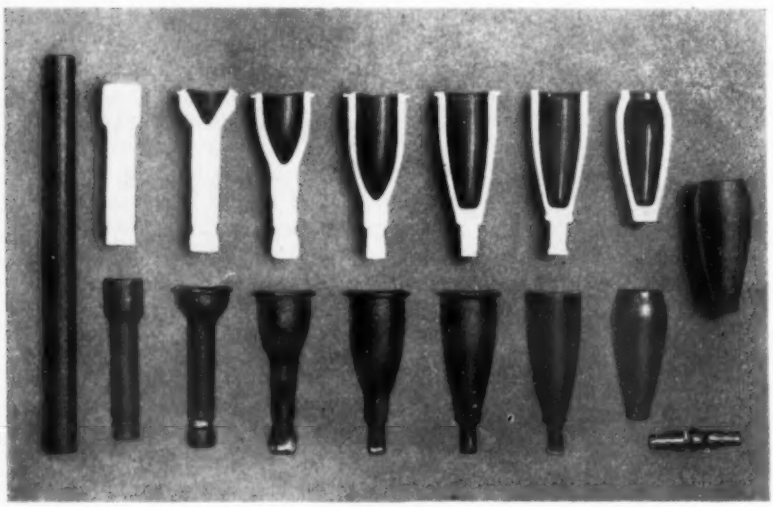


Figure 2

81 mm shell. Sectional and outside views by operations.

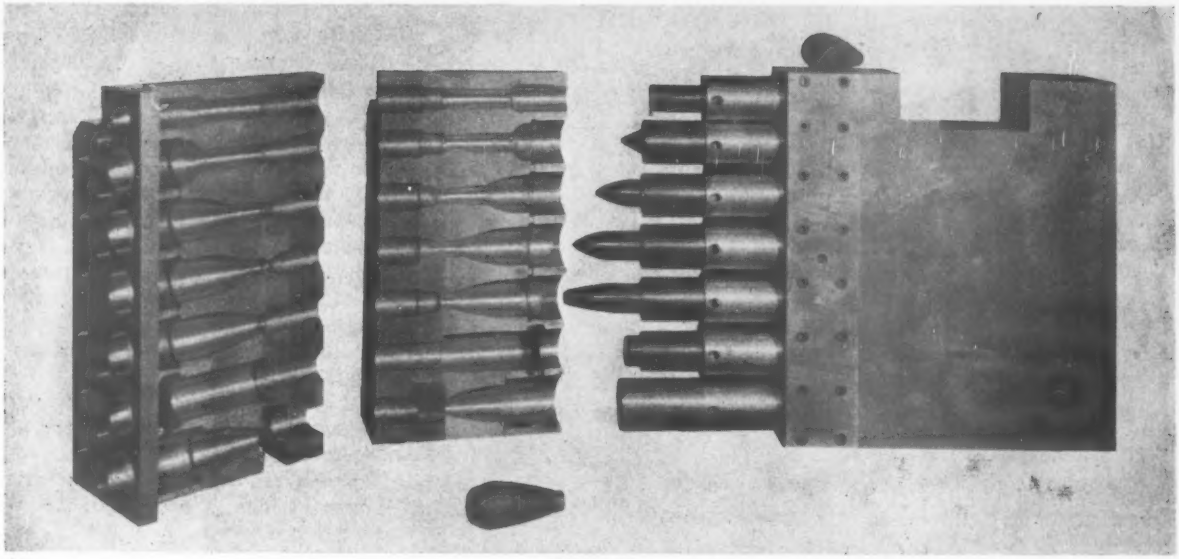


Figure 3
81 mm shell dies. The back end is squeezed, the nose end pierced and expanded.

Working Nose End

On the 37 m/m die, we have had people say that this could be made in three operations—which is true—but not only would the die life be considerably shorter, but the constant working of the metal in the nose end of the shell, which is essential for proper structure, would be partially eliminated.

Taking up the next two sizes of shell, that is, the 60 and 81 m/m trench mortar shells, which are almost uniform as regards everything except size, note *Figure 2* illustrating both a sectional view of the various operations as well as an external view.

These shells are made in a seven-operation die. The complete set of dies and punches for producing this 81 m/m shell is shown in *Figure 3*. This shell is forged by reducing the back end by squeezing, at the same time piercing and expanding the nose end. Due to the tapered form of this shell, a very close study of volumes and cross-sections must be made and incorporated in the dies and punches.

On the 81 m/m shell, 1¾" diameter stock is used in a length sufficient to make two shells. One-half the bar is heated, the shell forged complete in the seven operations and sheared from the other part of the bar in the last pass.

The collar which is started and forged in the second operation has several functions: it permits the operator using this collar as a gauge point in the successive passes. It also assists in holding the metal against the forward movement of the punch and also acts as a reservoir, taking care of slight variations in volume due to the variations in the diameter of the stock. It also assists in holding the forging against the receding movement of the piercing tool. This method of forging the collar in the first or second operation is generally used on all shells forged with a cavity.

One item of outstanding importance is the accurate alignment of the punch and work in the operation in which the piercing begins as this operation starts the center for the piercing punches that follow. If this is central to begin with and the heats are uniform, concentricity of the entire shell will be uniform. You will note that in every case, the piercing punches for the 81 m/m shells are piloted in the die.

A simple form of manipulator has been developed for handling the forging of shells from pass to pass. (*Figure 4*) This manipulator not only takes the weight of the piece off the operator, but also lines the work up in the succeeding cavities. We find this manipulator, because of these features, increases production by approximately 10 to 12%.

The weight of this forging as made to Ordnance Department prints is from 6 lbs. 10 oz. to 7 lbs. Where forged and finished by one contractor, it can be reduced to about 5 lbs. 10 oz.

Taking up next the 75, 90 and 105 m/m high explosive shells, which are similar in form and require the same number of operations to forge, would state that all of these sizes can be made in either five or six operations. I say that because the collar which you saw on the 81 m/m shell and which is also characteristic of the 75, 90 and 105 m/m shells, can be either sheared in the machine in the sixth operation or in a separate operation in a press if desired. The advantage of shearing the collar after leaving the machine is that it permits an increased capacity in the machine itself as the operations are reduced to five. Only a small inexpensive press is required to shear this collar if performed in a separate operation.

For the 75 m/m shell, 2⅜" or 2-7/16" diameter stock is used in a length sufficient to make two shells. One end of the bar is heated, the shell is then forged on this end in five or six operations and sheared from the bar in the last operation. The remaining half of the bar is then heated and a shell forged from same.

Punch Life

One of our outstanding installations on 75 m/m shells is located at the Milwaukee Works of the International Harvester Company, using a 4" Acme Model XN Forging Machine. Punch life, which has always been a great source of trouble in the forging of shells by any method, has been de-

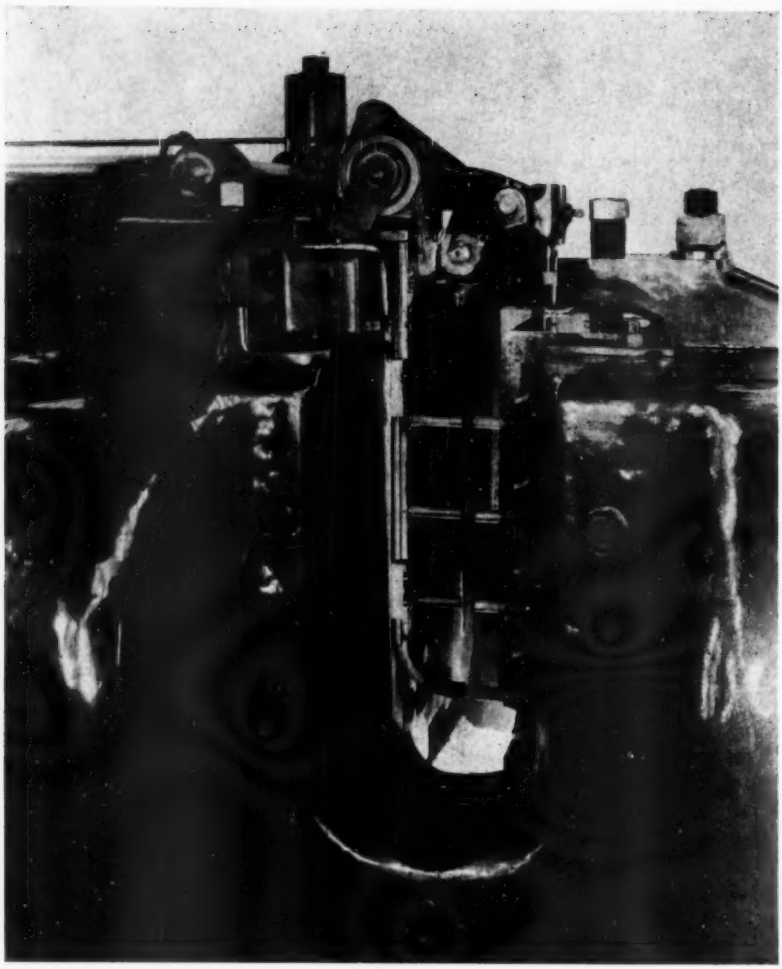


Figure 4
Manipulator for 81 mm shell. The weight is taken off the operator.

veloped by this company from 1,000 to 2,000 forgings on the finishing punch to more than 17,000 forgings on the finishing punch. They find that by keeping the working temperature of the punches between 800 and 900° F. they get the maximum life out of a punch. This temperature is not high enough to have any tendency to draw the hardness of the punch. In dropping below 800°, they find there is a tendency for the punch to crack Also, constant punch temperature tends to more uniform cavity dimensions. Both the forgings and the dies are lubricated with an oil and graphite mixture.

This Machine has been in operation approximately ten months and has produced nearly 400,000 forgings. The forgings as they come from the machine are placed on a conveyor and are forced-air cooled. Direct ducts on the side of the conveyor gets them to a black heat with as little delay as possible—a Brinell of 212 to 218 being desired. This concern is forging about 10,000 shells per week and their rejections from the forging operation average only from 5 to 15 shells and a two-weeks' run has been made with no rejections. This record is due to a thorough inspection and maintenance of tools, proper heating, good operators and proper supervision. Incidentally, our machine on that job has been tripped nearly two million times, running on a twenty-four hour schedule, five to six days per week.

Use of Inserts

The 105 m/m shell is made in substantially the same manner the production running about 65 shells per hour. The size of stock for the 105 m/m shell is dependent on whether the company forging the shells also finishes them. If this is the case, 3" diameter stock is sufficient. If the shells are to be forged to meet ordnance department specifications and finished in another plant, 3¼" or 3⅜" diameter stock is required.

Now, on the subject of dies, in all the shells we have discussed, we use inserts for nipping or necking the shell to the small diameter at the base in the successive operations. As regards the die cavities, we recommend inserting the cavities on the 60 and 81 m/m shells. These inserts can be turned and bored in a lathe, the final cavity form being given by a single-point tool with a travel controlled by a cam, the latter being made with the correct cavity contour. One of our customers determines by the weight of the 81 m/m forging the time to replace inserts. When there is a 5 oz. increase in weight due to insert wear, the inserts are changed.

In making the punches, the same method is used, the cams being made for the contours of the various punches. The practice on the punches is to turn them to the correct contour, allowing for a grinding finish, harden them and then grind them in the same manner as they were turned, using a cam follower for the grinding wheel. After grinding, they are drawn to the proper hardness, the slight scale left on them from the drawing operation being left on as it is a great asset acting as a lubricant in the first few operations and permits the punch to take on a glazed surface instead of scoring.

With reference to the dies for the 75, 90 and 105 m/m sizes, in which the cavities are straight, these may be inserted or not, as desired. The life of the dies on these sizes will run somewhere between 25,000 and 35,000 pieces before new inserts are required, or if solid dies are used, before replaning and re-boring of the solid dies.

With reference to the solid dies, we recommend that if this method is used that a jig be made having bushings supporting the boring bar the proper center distances — 1/16" or ⅛" would be planed off the faces of the dies, after which they would be matched up together, placed in the jig which has a locating point locating from the bottom of the die—which is the same point in which the die is located in the machine. This would insure uniform cavity centers and, especially on the straight type of cavity, we believe that this is a simple and economical way to maintain shell forging dies.

Successful machining of stainless alloys depends primarily upon the proper tooling and machine practice; here are some facts that will help.

Machining Stainless Steels

By GEORGE STEVENS

Rustless Iron & Steel Corp.
Baltimore, Md.

THE successful machining of Rustless stainless steels depends to a great extent upon proper tooling and machine practice. Because of the inherent toughness of these high alloy materials and their variation in machining characteristics, the importance of the use of correct cutting rates and tooling methods cannot be overemphasized.

Since the alloy content of stainless steels varies in amount and nature, along with a variation in carbon content, the stainless steels fall into three general classifications with respect to their machining characteristics: (1) the straight chromium, low carbon alloys which may be either non-hardenable or hardenable by heat treatment and which consist of standard and free machining compositions, (2) the straight chromium, high carbon alloys, high hardenable by heat treatment and (3) the chromium nickel, non-magnetic alloys, hardenable by cold work only and available in standard as well as free machining grades.

Turning Rates

The turning rates shown in *Figure 1* which were obtained under a specific set of cutting conditions and based on a five hour tool life, will show how these compositions compare, and illustrate the benefit of sulphur additions to improve machinability.

Beginning with the column on the left, it will be noted that the highest turning rates were obtained with Type 430F grade. It will be seen that this is a straight chromium sulphur-bearing alloy, non-hardenable by heat treatment. This material yields a brittle chip of a free-machining nature.

The second column represents the cutting rate obtained with Type 416 grade, a 14% straight chromium sulphur-bearing alloy, hardenable by heat treatment. This material also yields a brittle chip of a free-machin-

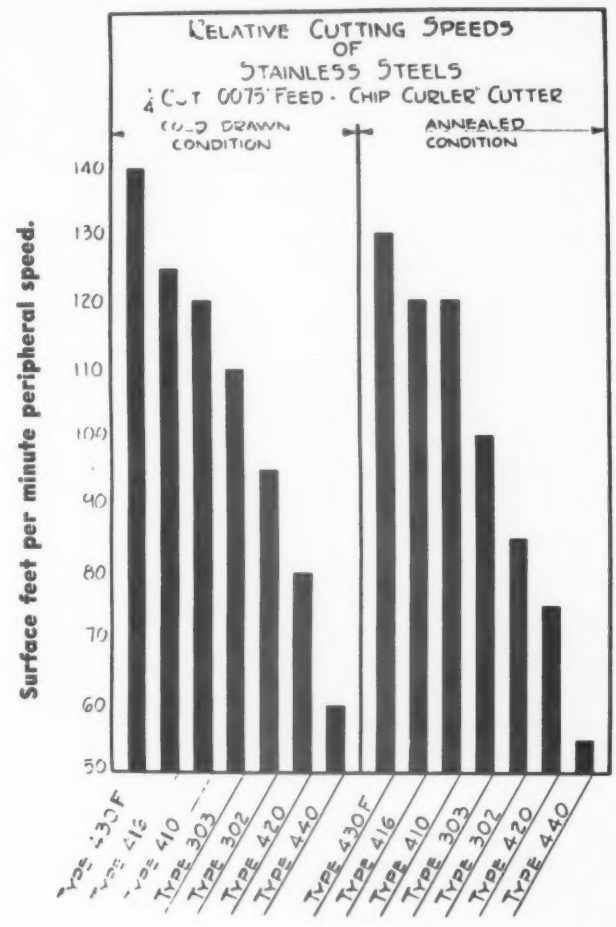


Figure 1 *Turning rates of different compositions.*

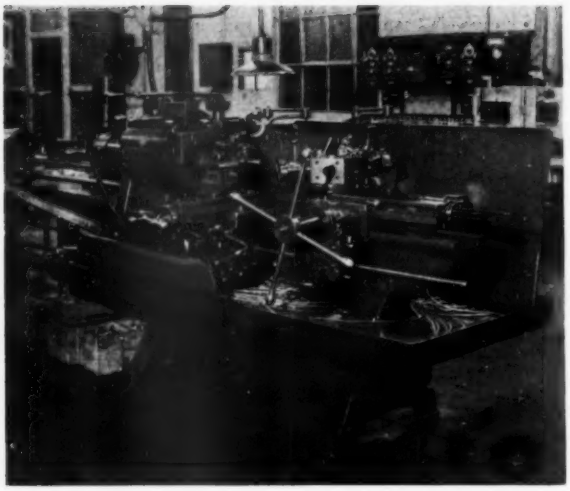


Figure 2
Laboratory set-up by which tests charted in Figure 1 were made.

ing nature and compares closely in other machining operations with Type 430F.

The third column represents the cutting rate obtained with Type 410, a 12% straight chromium low carbon grade, hardenable by heat treatment. This material yields a stringy type chip and does not possess the free-machining characteristics of the sulphur-bearing grades 430F and 416.

The fourth column represents the cutting rate obtained with Type 303. This is an 18% chromium, 8% nickel, sulphur or selenium-bearing, free-machining grade, non-magnetic, hardenable by cold work only. This material yields a stringy type chip of a free-machining nature. Although this grade did not yield a cutting rate as high as Type 410, it will nevertheless out-perform Type 410 in many other machining operations, such as threading and tapping, due to the free-machining characteristics imparted by the sulphur.

The fifth column represents the cutting rate obtained with Type 302 or 304. This is an 18% chromium, 8% nickel grade, non-magnetic, hardenable by cold work only. This material yields a tough and stringy chip. Although the turning rate for this grade closely approaches the free-machining Type 303, it is nevertheless much more difficult to machine in other operations, particularly drilling, forming, tapping and reaming.

The sixth column represents the cutting rate obtained with Type 420. This is a 13% chromium, .35 carbon grade, which due to its high carbon content may be hardened and strain relieved to Rockwell C 48-52. This material yields a stringy but brittle chip.

The seventh column represents the cutting rate obtained with Type 440. This is a 17% chromium, .90 carbon grade, which with its still higher carbon content, may be hardened and strain relieved to Rockwell C 55-60. This material yielded the lowest turning rates and is one of the most difficult of the stainless steels to machine.

The right side of the chart shows similar cutting rates obtained on these grades in the annealed condition. In general, it will be noted that the turning rates were slightly lower than those obtained with the cold drawn materials. The only exception to this rule was the Type 410 material which yielded cutting rates approximately the same in both conditions.

Laboratory Set-Up

The turning tests from which the data in *Figure 1* were obtained, were conducted in the laboratory. In order that these tests would duplicate commercial practice as closely as possible, they were made on a Warner and Swasey turret lathe *Figure 2* 1¾″ bar capacity, equipped with a 7½ H.P. variable speed motor and a 34 point rheostat control. This equipment provided plenty of power and a wide speed range. It also possessed sufficient versatility so that tool set-ups for turret, engine and automatic lathe could be approximately duplicated.

The latest type box tool holder, equipped with rollers to burnish the turned part, was used for these turning tests.

Figure 3 shows the chip curler type of tool set-up in relation to the work piece. Because 1″ round bar material is large enough for heavy duty turning and a common size, it was selected for these tests. The length of cut was 2½″; the depth of cut was fixed at ¼″. Feed per revolution was .0075″. A cutter life of five hours continuous cutting was selected as representative of the ideal requirement for turning tools. To obtain this tool life, tests were run at decreasing spindle speeds until this tool life was reached. The cutting tools were high speed steel of 18-4-1 composition with a Rockwell hardness of C 63-65. The coolant

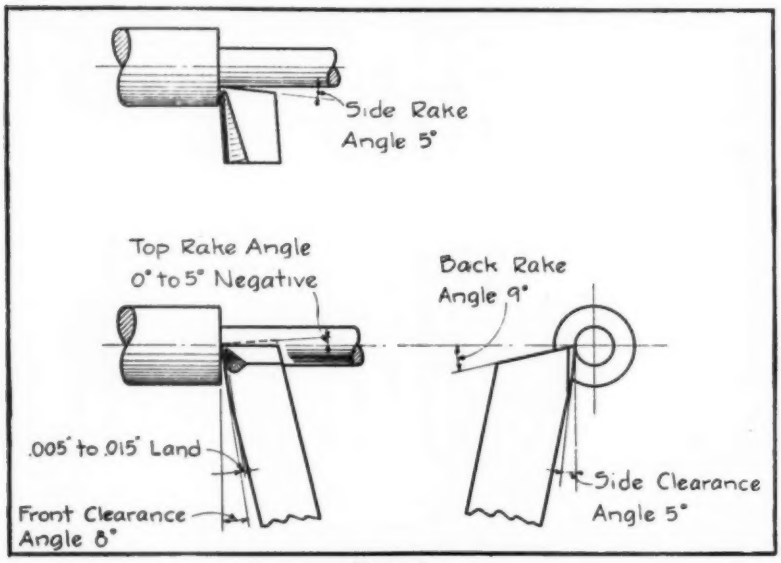


Figure 3
Chip curler type of tool set-up.

used was a sulphur base oil cut 1 to 1 with paraffin oil.

Figure 4 shows the modern box tool holder used for the turning test. Its short rigid design and heavy construction make it ideal for heavy turning operations. The lack of space behind the cutting tool, however, resulted in a difficult chip disposal problem. By reason of this condition, the chip curling type of tool was selected, firstly, because it produced a continuous type chip which completely removed all the turnings from the vicinity of the box tool holder, and secondly, because it yielded a good surface finish.

Figure 4
Box tool holder used for the turning test.

Rake Grind

We have all heard about the built-up edge on a tool and the continuous type chip. The rake grind alleviates built-up edge, a serious problem encountered in cutting very ductile materials such as the 18-8 chromium nickel Types 302 and 304. However, if a steep rake angle is used on the tool for these materials, it is weakened, and rapid failure occurs due to the tool's inability to carry away the heat generated by the cutting action as depicted by the shaded area on the sketch, *Figure 5*. The use of a hook or chip curler grind permits the use of a steep rake angle with enough metal left on the tool to permit better dissipation of the heat generated by the cutting. The back part of the groove also plays an important part in this by exerting a lifting action on the chip.

Figure 6 illustrates the type of failure encountered with these tool tests. This shows three cutters, two of which failed after five hours of continuous cutting. It will be noted that instead of failing at the extreme tip, as might be expected, they actually failed at the point where the tool was cutting at the surface of the bar.

It is logical to assume that initial failure would occur here, since this section of the cutter removes not only a larger volume of metal per unit of time, but also removes it at a greater peripheral speed. This is illustrated on the right hand side of *Figure 7*, which pictures the conditions existing with a heavy ¼" cut. If the outside diameter of the 1" round material was turning at 100 SFM, the material at the tip of the tool where the section is ½" diameter, would be actually turning at only 50 SFM, thus enabling the weaker section of the tool, which is the point, to stand up until failure first occurs at the side of the tool. Additional turning tests conducted in the laboratory with lighter depths of cut, such as 1/16" and 1/32", seem to substantiate this, since with lighter cuts, much lower cutting rates were obtained and tool failures then consistently occurred at the nose or point of the tool. This condition is pictured on the left-hand side of *Figure 7*. In this case, with a 1/32" cut, the outside diameter of the bar is moving at 100 SFM and the material at the tip of the tool is moving at 97 SFM. This subjects the tip of the tool to a much higher cutting rate than with a ¼" depth of cut.

To further support this theory, *Figure 8* pictures a 1" drill penetrating at a cutting rate of 60 SFM. To redrill this 1" hole with a 1-1/32" drill at the same cutting rate of 60 SFM would not be practical, due to excessive wear on the edges of the larger size drill. Again, this strongly suggests that light depths of cut are detrimental to tool life. Returning to the chip curler type of tool, as the chip curler proved particularly effec-

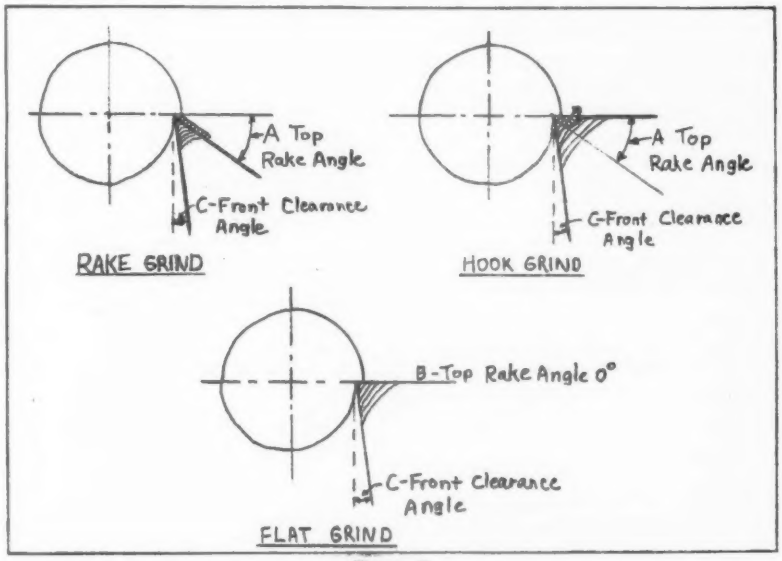


Figure 5
The hook grind eliminates built up edge, yet provides better heat dissipation than the rake grind.

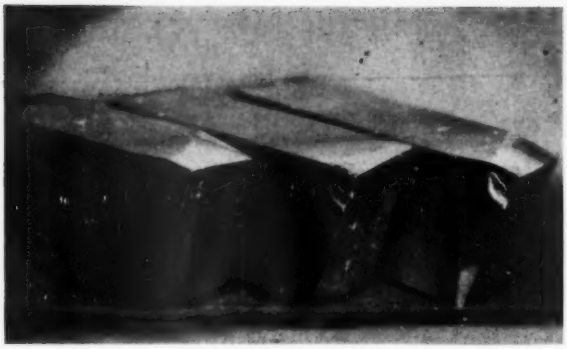


Figure 6
Type of failure encountered —not at tool point.

tive with Types 302 and 304 material, the same principle was applied to a drill.

Chip curler grooves were ground in the flutes of a drill as shown in *Figure 9*. In order to make a comparison of this drill with the standard type, tests were conducted with 1" round Type 304 material at a drilling speed of 80 SFM .0075" feed per revolution. With the standard 5/8" diameter drill, 17 bushings 1½" in length were drilled when failure occurred. With the special drill, it was possible to complete over 100 bushings without drill failure and cutting time actually decreased 25%. The drilling speeds for stainless range from 50 to 110 SFM for the free machining types and from 20 to 60 SFM for the regular grades.

Forming Tools

This same principle of a hook grind or chip curler can also be applied to forming tools, *Figure 10*, particularly when forming Types 302 and 304. A 10° top rake angle is advocated for the free machining types and 15° for the regular grades. Forming tool speeds for the various types of stainless are usually higher than the turning rates obtained with ¼" depth of cut. Ranging from 120 to 140 SFM for the free machining types and from 60 to 100 for the regular grades, feeds are governed by the type of machine and width of form tool.

Hook or chip curler grinds are not generally recommended for milling cutters due to their intermittent cutting action. However, as a general rule, these tools are ground with a 10 to 15° rake angle and backed off 5 to 7°. They should be of spiral design whenever possible. Operating speeds range from 60 to 100 SFM for free machining grades and from 35 to 50 for the regular grades.

Another machining operation which is sometimes the cause of more than one headache is tapping the Type 302 or 304 grades. Hook or chip curler grinds in the flutes of the tap have proved in this case to be very beneficial. The hook grind should always include the first full tooth. Tapping speeds for the free machining types of stainless range from 25 to 50 SFM and from 5 to 25 for the regular grades. It is not advisable to tap more than 75% of a full thread. For large sizes, collapsible taps have been successfully applied commercially, and for through holes a two or three flute gun tap is usually the best. For turret lathe and automatic screw machine applications, it is very important that the taps be mounted in a floating holder to insure proper alignment.

Reaming

Another important operation which depends for satisfactory results upon proper alignment, is reaming. Close tolerances may be maintained by floating the reamer into the work piece with the use of a center. A spiral fluted reamer with a 30° chamfer or lead is recommended for all general purpose work. Reaming speeds and feeds for the various types of stainless are governed by surface finish requirements and tolerances of the machined part. 30 to 100 SFM is recommended for the free machining grades and 20 to 80 for the regular grades. It is also advisable to keep the reamer sharp by frequent stoning.

Hook grinds are also applied on threading chasers except for the tangential type. The tangential type chaser angles are usually ground 10 to 25°. The radial and inserted type chasers are ground 10 to 15°. For the larger size thread, the tangential type chasers work very well with stainless, evidently due to the high rake angles which can be used. It has also been found particularly adaptable to coarse threading operations, such as Acme type threads, where difficulty is usually experienced in holding the lead of the thread. The radial and inserted type chasers are better suited to the smaller size threads, particularly in automatic screw machine applications. Threading speeds for stainless usually

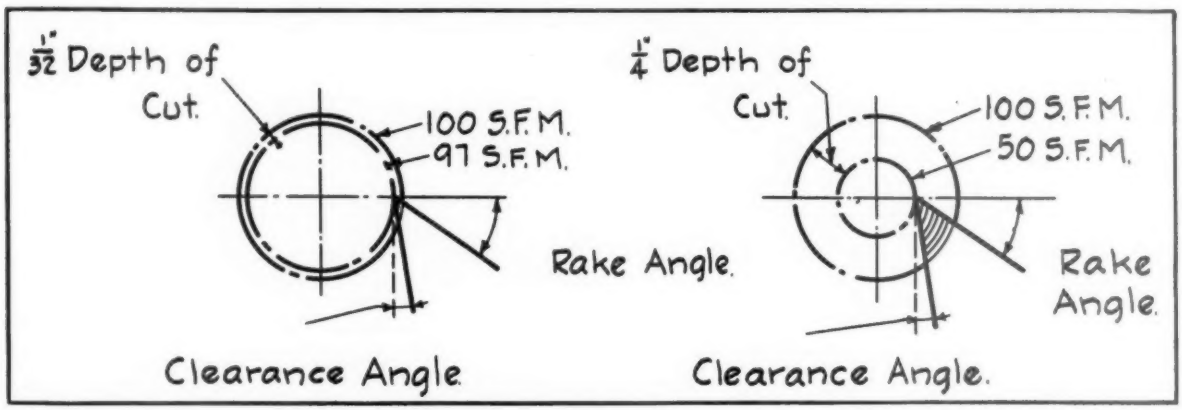


Figure 7
With shallow cuts failure occurs at point; with deep cuts, at surface.

range from 20 to 40 SFM for the free-machining and from 15 to 25 for the regular grades. For very smooth threads, satisfactory results have been obtained by reducing the threading speeds to approximately 10 SFM or lower.

As cutting oils play a prominent part in machining stainless, an investigation of this factor has been undertaken. Although this work is still under way, a few important general observations have been made which may be mentioned:

(1) The sulphochlorinated lubricants containing approximately 97% mineral oil and 3% sulphur, have so far yielded the best turning rates.

(2) Sulphochlorinated oil cut 1 to 1 with paraffin oil, yields the highest cutting rates with *heavy* depths of cut.

(3) Sulphochlorinated oil cut 1 to 6 with paraffin oil, yields the highest cutting rates with *light* depths of cut.

Proper Cutting Oils

It has been established that cutting tools are subject to high cutting temperatures and tool pressures. These pressures range from 250,000 to over 400,000 lbs. per sq. inch. With a heavy depth of cut, the tool is subjected to high cutting pressures, but as the tip of the tool is actually cutting at a greatly reduced rate of speed, a more even distribution of the high cutting temperature is obtained. Under these conditions, the anti-weld characteristics of a sulphurized oil appear to be of more importance than its cooling effect and a heavy 1 to 1 mix with paraffin oil seems to yield the best results. With light depths of cut, tool pressures are lower. Nevertheless, the cutting temperatures are probably higher due to the poorer heat dissipation at the tool tip, and to the greater peripheral cutting rate. In this case, an oil possessing better cooling qualities, such as 1 to 6 mix with paraffin oil, has so far yielded the best results in our tests.

In order to illustrate the importance of the proper selection of materials, conditions of heat treatment and correct tooling in machining stainless steels, a few examples will be given of some of our actual experiences in the field. The first case has been chosen to show that it is sometimes not advisable to attempt to utilize the improved machining characteristics of the free machining grades without first considering the reduced toughness imparted by sulphur and selenium.

The part was a plunger used in a ruling pen and was first made from the Type 303 grade. The needle-like point was rather small in size—in fact, .017″ in diameter. After machining, this tip was subjected to a cold swaging operation to reduce it to .012″ in diameter and evidently improve the physical properties by cold working. However, because of the somewhat lower order of ductility of free machining grades, the tip was shattered by the cold working.

In order to provide material of greater toughness, it was suggested that the Type 304 or 18-8 chromium, nickel, non free-machining grade be tried. Although the turning rates had to be slightly reduced, the parts made with this composition cold swaged satisfactorily and eliminated this customer's difficulty.

The importance of ordering material in the proper condition of heat treatment was brought out in an interesting manner in the case of a customer who was deep-drilling 1½″ cold drawn hexagon Type 302 or 18-8 chromium-nickel material. The equipment used was a Pratt and Whitney rifle drilling machine, operating at approximately 40 SFM and .0002″ feed per rev. The depth of the hole was approximately 12″. In this instance, the cold drawn material did not machine as well as the annealed material. This unusual condition was finally traced back to the very fine feed being employed for this operation. The .0002 feed per rev. had more of a scratching effect than a cutting one and consequently, severely work hardened the surface and quickly wore out the drill. By applying annealed material with a much lower initial hardness, the final hardness resulting from cold work was decreased. As a result, a much longer and more satisfactory drill life was obtained when annealed material was substituted for cold drawn.

As a further illustration, a case may be cited of a customer who was machining ¾″ cold drawn Type 416 or 14 chrome free-machining grade into a part used as a fitting for a tank radio antenna. This part required a deep drilling operation and was set up in a Brown and Sharpe automatic. The conventional set up for deep drilling on this type of machine usually requires the drill to be withdrawn at certain intervals to prevent the chip clogging the drill. This rule, referring to what is known as drill pull-outs, is as follows:

The depth of the first insertion should not exceed from three to four times the diameter of the drill and for the second, not more than 1½ times the diameter. The customer's set-up was as follows: 4 diameters for the first insertion and 2½ diameters for the second. It was at the end of this second operation that drill failure occurred. As the 4 diameters depth was the maximum permissible for the first insertion, and for the second insertion, 1 diameter over the recommended amount, it was only logical that drill failure would occur due to tightly compressed chips. It was decided to try this material in the annealed condition since being softer, it would yield a long stringy chip instead of a brittle one, thus enabling the chip to push its way out of the flutes of the drill. The use of annealed material in this specific instance enabled the customer to complete the job satisfactorily.

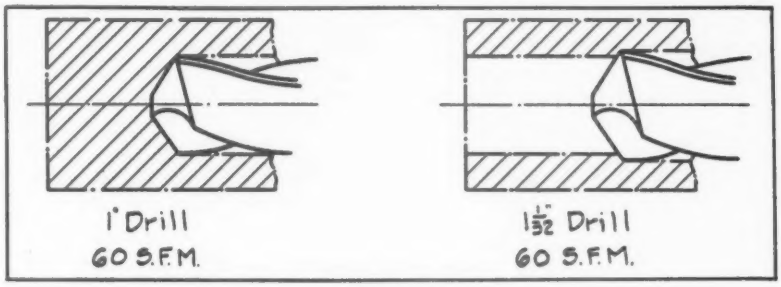


Figure 8
Excessive wear occurs in redrilling.

Finish Obtained

Little has been mentioned before about surface finish obtained with form tools. To illustrate this type of problem, an interesting case may be cited where a marked improvement in

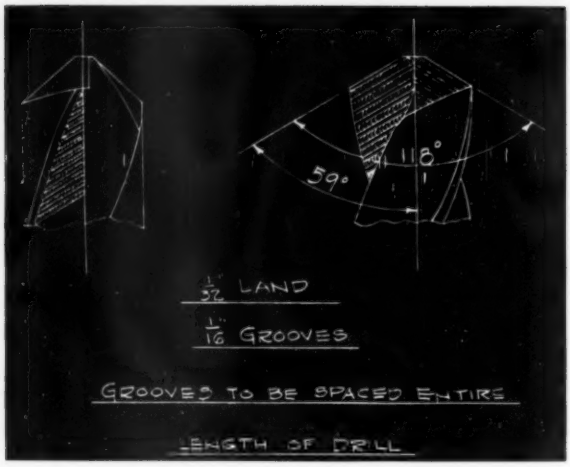


Figure 9
Chip curler grooves ground in the flutes of a drill.

surface finish was achieved by the somewhat unusual means of increasing the feed of the tool. The part was an aircraft carburetor jet made of 18-8 chromium nickel free-machining material, or Type 303. The part was made on a Greenlee four spindle machine and formed at a speed of 85 SFM feed .0008" per revolution. The surface finish on the side adjacent to the collet was satisfactory, but the opposite side yielded a surface finish marked with feed lines. In an effort to correct this difficulty, the angles on the form tool were changed and a complete revision made in their set-up, without, however, obtaining any improvement.

As a last resort, the part was set up in the laboratory turret lathe and after a few hours' work, a means of remedying this condition was found. It was discovered that by increasing the feed from .0008" per rev. to .0025" per rev., a finish was obtained which completely eliminated the objectionable feed lines. An increase in spindle speed from 85 to 120 SFM was also recommended, which combined with the increase in forming tool feed, resulted in a substantial gain in their production.

The use of cobalt tools has increased cutting rates in many machining operations involving stainless steels. The inherent brittleness of some of the higher cobalt tool steels should be kept in mind, however, when selecting them for certain operations. This was brought out when a customer complained that 18-8 chromium nickel free-machining 1" x ¼" flat stock consistently broke a sharp pointed tool used to cut a series of graduations on a balance beam to be used for weight scales. This operation was performed by hand with a specially built machine resembling a shaper and utilizing a hand lever for the cutting operation, and an indexing system to shift the scale for each graduation. An examination of the tool showed it to be 12% cobalt high speed steel. Upon witnessing this operation, it was apparent that because of the high impact imposed upon the small tip of the tool, at each cut, breakage occurred. A tougher high speed steel of 18-4-1 composition was applied with satisfactory results.

In conclusion, it will be realized that it is impossible to provide exact rules for the best machining practices which would cover the large variety of stainless materials, set-ups and operations. However, some general rules have been established which, if properly applied, will materially aid in machining these alloy steels.

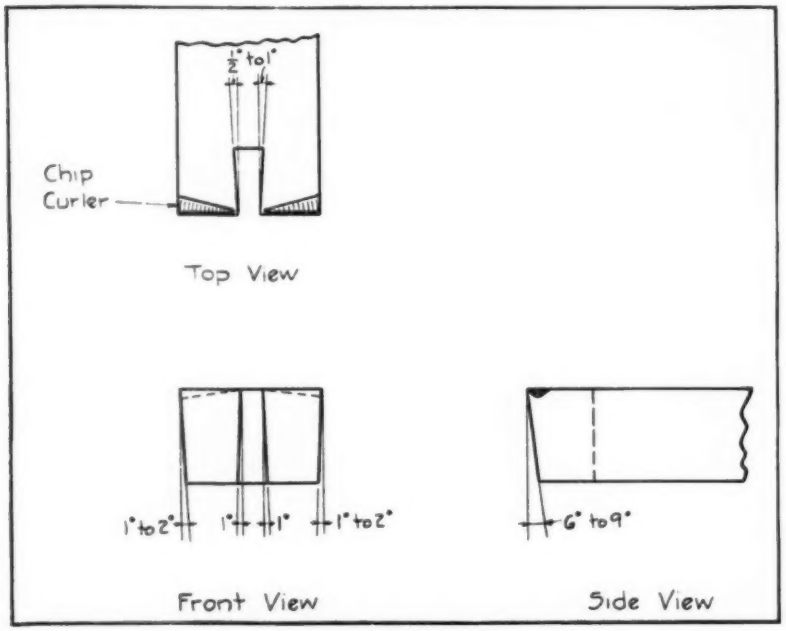


Figure 10
Hook grind applied to forming tools.

Proper Tool Angles

Particular attention must be paid to the proper tool angles and grinding methods employed. Turning and forming tools should be frequently stoned and correctly set up. Taps, die-heads and reamers should be properly mounted and aligned. It is sometimes possible to obtain passable results with improper tooling on screw stock and other free machining alloys such as brass or aluminum, but this is rarely true with stainless materials. The use of hook or chip curler type tooling is a fundamental requirement in the successful machining of 18% chromium 8 nickel non-free machining Types 302 and 304. Finally, the use of a good cutting lubricant properly applied is essential.

When the proper attention is given to these general rules, it has been found that most of the stainless alloys, particularly the free-machining grades, can and are being successfully machined in all tyes of production equipment and in many cases at rates approximately 80% of those obtained with regular carbon steel free-machining stock.

Simplified Ball Measurement of Helical Gears

By R. S. WRIGHT
Sier-Bath Gear Company, Inc.
North Bergen, N. J.

IN 1939 Dr. Zahorski of Oakland, California, gave to the gear industry a simplified but accurate method of applying Prof. Buckingham's Spur Gear formula to the calculation of helical gears. If any criticism may be leveled at Dr. Zahorski's work it would be that the article was written in academic language too high for the mathematical understanding of the majority of those who could put it to use. Even to the man fresh from the classroom, calculus and analytical geometry are very often hazy and so many who by accepting the mathematical processes by which the formulae was arrived at, could have used these formulae to advantage, instead became frightened by the mathematics and put it aside to be digested at some future time. Here then are the formulae devised by Prof. Buckingham for spur gears and later applied by Dr. Zahorski to Helical gears in the rotation for calculating the ball measurement.

λ=H.A. at base circle
ϕ=H.A. at Theo. P.D.
M=Measurement over ball
α=P.A. at Theo. P.D.
N=Number teeth in gear
W=rad. ball to be used
WI=rad. narrow imaginary disc
R=rad. to center of ball
T=Tooth Thickness on Theo. P.D.
α_2=P.A. at R

1) $\text{Tan}\,\lambda = \dfrac{B\theta \times \text{Tan}\,\phi_1}{\text{P.D.}}$

2) $W_1 = \dfrac{W}{\text{Cos}\,\lambda}$

3) $\text{Inv}\,\alpha_2 = \dfrac{T}{\text{P. Diam.}} \times \text{Inv.}\,\alpha_1 + \dfrac{WI}{B\theta\ \text{rad.}} - \dfrac{T_1}{N}$

4) $R = \dfrac{B\theta\ \text{rad}}{\text{Cos}\,\alpha_2}$

5) M=R+W+(distance from flat to CL of bushing)

You will note that measurement "M" is obtained over one ball only. Dr. Zahorski suggested measuring over two balls using four balls, two on each side of the gear welded together in the form of a dumbbell. In order to use these, the distance the balls are apart must be exactly alike in a set, otherwise there will be a distortion in the reading from one end to the other. This makes a set of dumbbells expensive and in order to have suitable sizes for measuring gears from 3-normal pitch to 16-normal pitch the price would be prohibitive. The solution is very simple. Using the Brown and Sharpe gear tester, place the gear to be checked on one stud and a bushing with a flat side on the other. (The distance from the flat to the center must be known exactly.) Place the ball between the teeth of the gear and bring the flat of the bushing firmly up against it. By use of the indicator, check that the flat and center line of the tooth space are at right angles. The measurement "M" is merely the distance from the center line of one stud to the center line of the other and can be read accurately from the vernier on the Brown and Sharpe tester. Besides checking the tooth thickness, there are two other advantages; first concentricity can be checked by taking three or four readings around the gear and secondly, it eliminates the extra calculation in the case of odd numbers of teeth. For convenient handling, a small piece of drill rod can be soldered on to the ball.

The use of pins has been condemned by many as untrustworthy because of the point contacts and difficulty of holding the pins parallel. The tooth calipers are good enough for a rough check but again because of contact and possible variation in addendum cannot be recommended for precision work. Therefore, for an accurate and practical method of measuring helical tooth thickness Ball measurement seems to be the answer and here is a simple application of it.

There is little that is original in this article for in addition to the use of Dr. Zahorski's and Prof. Buckingham's mathematical works, the final suggestion of a simple flatted bushing belongs to Mr. James Burrows, our gear department foreman. We hope that it will prove useful to the industry.

Hints on Cutting Tool Use

By FRANK W. CURTIS
Chief Engineer, Milling Machine Division
Van Norman Machine Tool Co.

SMALL tools are not as plentiful today as they were a year or so ago, largely because of the enormous demands set forth by our armament program. New plants have sprung up everywhere, existing factories have had to swing over to defense work and additional shops are being added daily to turn out some form of needed war equipment. All this has resulted in a peak load on our small tool manufacturers, so much so that deliveries of cutters, hobs, drills, taps and many other perishable tools have been set back to a point where the user must anticipate his needs many weeks in advance.

So, with cutting tools hard to get, it becomes necessary to conserve our present supply, as well as to get the most out of those we are able to obtain. Every shop, therefore, should establish some form of conservation policy with a view of reducing breakage, avoiding abuses and overcoming carelessness. This can best be accomplished by an educational program based on correct machining practices so that tools can be made to go farther.

The accompanying sketches represent ten suggestions that, if followed, will assure better tool performance. The most important requisite is the training of new operators. A small-tool engineer should be available for this important task because inexperienced men learn quickly if properly guided. This engineer should check up all tool set-ups, explain the theory of metal cutting to operators, point out why correct angles are so necessary, investigate the causes of and find remedies for tool breakage, conduct all tool tests necessary to be'ter performance, supervise tool sharpening, and handle many other duties pertaining to the use of cutting tools. Tool expense due to carelessness must be eliminated because, today, the actual cost of tools is secondary to the inability to get them. Since it is impossible to replace broken tools quickly a serious delay is bound to result. It is because of this that a conservation policy is so imperative, with education and instruction as its foundation.

Using tools of improper size and style causes many difficulties, loss of time, and added tool cost. Trying to perform a heavy job with a light tool usually results in breakage, or a heavy-duty tool on a light job may pull the work out of place and break a machine. Nothing is worse than a misfit, so take time to get the right tool and get a good start. Trying to get by with the wrong tool is the first step to defeat.

Nothing is more important in metal cutting than the use of correct speeds and feeds. With all the excellent information available on this subject there is, perhaps, more tool loss directly responsible to improper rates of cutting than any other cause. Cutting speeds too often are established on a "hit or miss" basis, rather than by actual calculations in relation to the material being machined, the depth of cut, and the type of tool. Correct speeds and feeds are as important as the selection of the right tool and will contribute much to the elimination of waste.

Rigidity in metal cutting is very important to tool life and performance. Vibration and chatter are evils that develop when any weakness exists. Positive clamping, therefore, is important if the most out of tools is to be expected. If a workpiece is not held securely, tool breakage often results. If a jig or fixture now in use appears to lack proper clamping it should be corrected immediately. It does not pay to take chances.

Correct Angles

Many advances have been made in cutting oils and coolants during the past few years and, today, startling increases in tool life can be obtained by applying the type and grade best suited for a given operation. There is a surprising difference in the performance of oils that may look alike. Therefore, it will pay to investigate the various compounds available so that the best can be applied.

Tool sharpening is an art in itself which contributes more to tool life than any other factor. Practically all the theories and practices of metal cutting center around the rake and clearance angles of the cutting tool. To get the best results, therefore, correct angles must be considered. In sharpening tools it is also important to use correct grinding wheels to assure sharp cutting edges and to avoid burning.

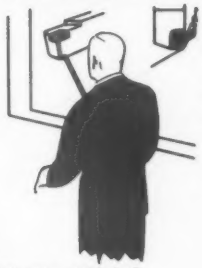
One important consideration in using tools is to avoid over dullness, which so often results in the need of excess sharpening or the grinding away of the cutting edges. When the edge of a tool becomes partially dull, continued use causes rapid or excessive wear away from the edge. This results in waste because so much material has to be removed to restore a sharp edge. Moreover, an over dull tool overheats and often loses its hardness, or may even break due to the added pressures that are set up. Sharpening tools more often, removing less per grind, is a right step in tool conservation.

Sometimes, excessive tool cost may result from some fault in the workpiece itself. Too much allowance for machining is one evil that causes rapid tool wear. Often, the depth of cut can be reduced so that a given part can be machined faster and with less tool sharpening, in addition to a saving in material cost. Another troublesome condition is that of machining hard materials. Castings with hard spots cause much tool trouble and if the condition cannot be corrected in the foundry, it often becomes necessary to anneal them. Moreover, the machining of heat-treated steels results in excessive tool costs. Very often heat treating is carried out as an initial operation and tough cutting is necessary all along the line whereas many parts so made could be roughed and semi-finished in the soft state and treated just before being finished with the result that many tool difficulties would be eliminated.

Most tool troubles can be traced directly or indirectly to the conditions which have been outlined. So, by considering their importance in connection with metal-cutting operation, better tool performance will result.

Getting the most out of Small Tools

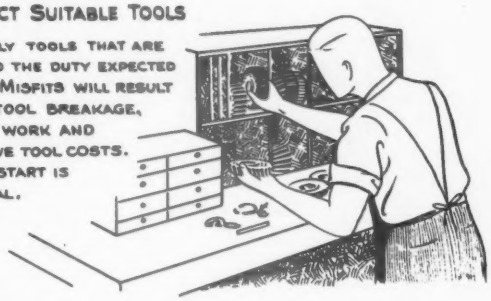
① Small Tool Engineer



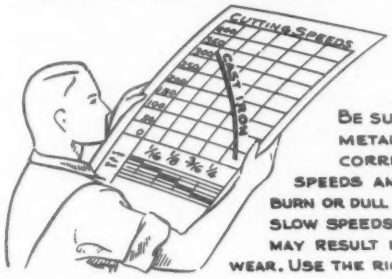
Train and educate machine operators as to the best practices in using small tools so that you will get the most out of them. New operators need lots of help.

② Select Suitable Tools

Use only tools that are suited to the duty expected of them. Misfits will result only in tool breakage, spoiled work and excessive tool costs. A good start is essential.



③ Correct Speeds And Feeds

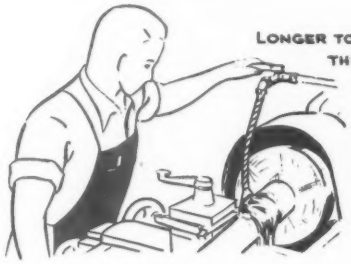


Be sure the rate of metal removal is correct. Excessive speeds and feeds will burn or dull tools quickly. Slow speeds and fine feeds may result in excess tool wear. Use the right combination.

④ Positive Clamping

Nothing can cause tool breakage quicker than a loosely held work-piece. Be sure your jigs and fixtures provide for positive rigid clamping under all conditions.

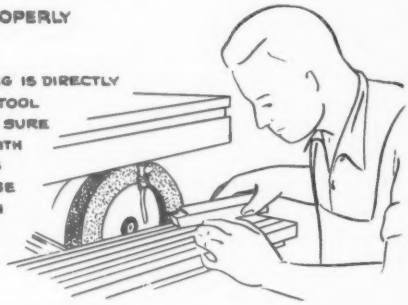
⑤ Apply Best Coolant



Longer tool life is possible through the use of correct cutting fluids. Different coolants and oils are available for all forms of metal cutting. Apply the right kind always.

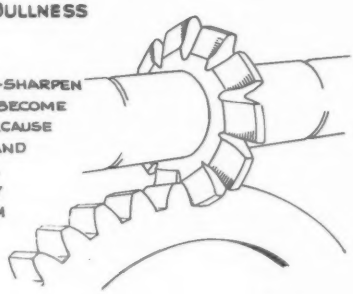
⑥ Sharpen Properly

Tool sharpening is directly responsible for tool performance. Be sure to grind tools with the right cutting angles and to use proper wheels in order to obtain longer tool life.

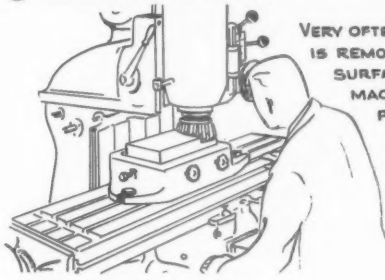


⑦ Avoid Over-Dullness

It is better to re-sharpen tools before they become excessively dull because you will save time and tool expense. Dull tools break easily and do not perform well.



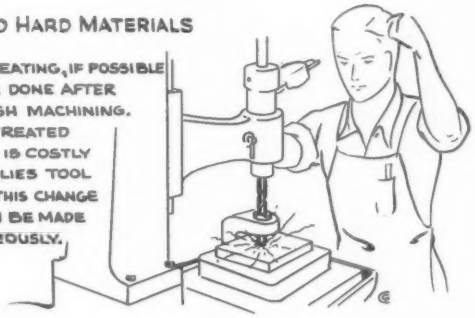
⑧ Reduce Depth Of Cut



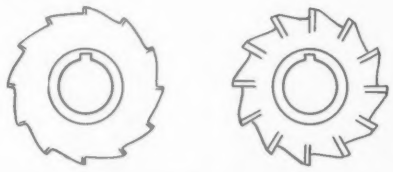
Very often too much metal is removed from a given surface. Reduce the machining allowance proportional to the size of the work-piece and you will reduce tool expense as well as material costs.

⑨ Avoid Hard Materials

Heat treating, if possible should be done after semi-finish machining. Cutting treated materials is costly and mutiplies tool expense. this change can often be made advantageously.



⑩ Salvage Old Tools



Damaged or worn-out tools should not be thrown away. Many of them can be salvaged by regrinding to smaller sizes. Waste must be eliminated.

National Defense needs require the adaption of standard equipment for special types of production work.

Utilizing Standard Equipment

By ARNOLD THOMPSON
President, Tool Engineering Service Reg'd., Toronto

The Tool Engineer can do much to conserve time and material by utilizing many of the small units now on the market and by designing self-contained apparatus on their own benches. These units are usually in stock and in most manufacturing concerns there may be quite a number of them in the unused equipment.

As an example of such adaptation I have illustrated three uses for internal grinding heads:

Figure 1 is the simplest of such application and consists of internal grinding head (A) on a bench (B) with motor (C) and an intermediate pulley drive (D) and switch control (E). The head (A) may be fitted with any form of chuck (F) either hand-operated or by pedal (G). Such operations as reaming, boring, chamfering, filing, polishing, pointing, size tapping, and threading and even gauging, on small parts, can be done by hand, utilizing youths' or female help.

Figure 2 is an adaptation for the drilling of small holes where (A) is the head, (B) the bench, (C) the motor, and (E) the switch. The head (A) is mounted in the slide (H) and

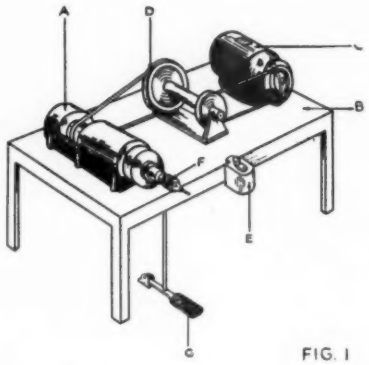


FIG. 1

operated by hand lever (J). Any type of fixture (K) either for single holes or indexing, can be arranged. By duplicating a motor and spindle at the other end, 2-hole or double-end centering can be arranged.

Figure 3 is another adaptation of spindle head for milling. Head (A) motor (C), bench (B1) with angle plate (B2), switch (E), slide (H), and handle (J). This slide arrangement is provided for removal of the milling cutters.

Fixture (K) can be arranged for holding any type of small work with a self-contained hand movement, for such types of work as, slot milling, face milling, or contour milling.

All these three equipments illustrated have been in standard use for national defense small parts and have proven very efficient and can be made up by semi-skilled labour.

There are many other adaptations that will suggest themselves to the Tool Engineer. The advantage of using standard grinding heads is, they have precision bearings that can be run at high enough speeds to take care of the drilling and milling, of small steel, brass, and aluminum parts.

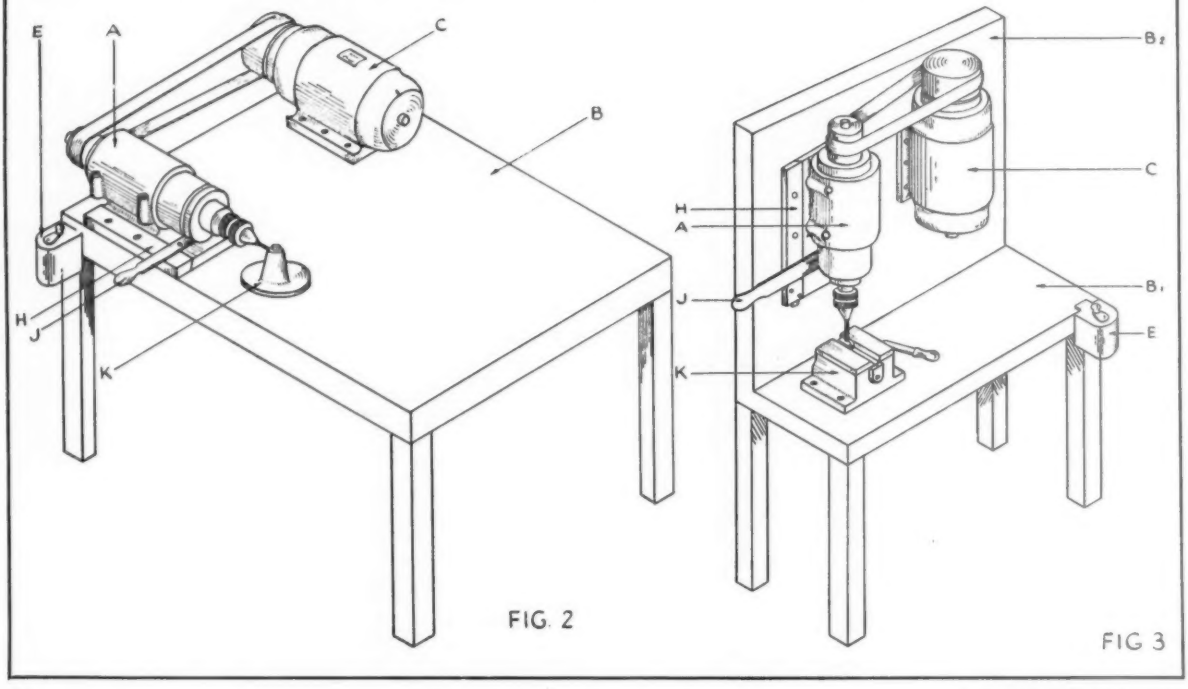


FIG. 2

FIG 3

Tool Engineering DATA SHEET

MILLING CUTTERS FOR DURAL—I

By A. C. Siegel, General Foreman, Airplane Division, Curtiss-Wright Corp.

(First of Two Parts)

The success of high speed milling is dependent largely on the rigidity of the machine, the design of the fixture, the method of holding or clamping and the shape or type of work involved.

When cutters were first designed for this type of milling the following tests were made:

First Test: Material—24 ST Dural
Cutter—6" x 5/8" x 1"—11 teeth (side Mill)
Depth of Cut—1.9"
Spindle Speed—1200 R.P.M.
Feed—18"
Machine — No. 2 Cincinnati Horizontal Mill

Second Test: Material—24 ST Dural
Cutter—3/4" Dia.—4 flute
Depth of cut—.415"
Spindle Speed — 1500 R.P.M.
Feed—20"
Machine — No. 2 Cincinnati Horizontal Mill

Third Test: Material—24 ST Dural
Cutter — Face Mill 5½" Dia. Carboloy tipped inserted blade.
Depth of Cut — .300" x 3½" wide
Spindle Speed — 1500 R.P.M.
Feed—20"
Machine — No. 2 Cincinnati Vertical Mill

Since these tests we had the Gorham Tool Co., Detroit, Mich. make us the following cutters.

P 12100 — 4" dia. 5 blades—tipped blades
P 12099 — 6" dia. 6 blades — tipped blades
P 12098 — 8" dia. 6 blades — tipped blades

We had some cutters made with 3 blades, but with 1500 R.P.M. as a maximum speed we did not get as good results as we now do with 5 or 6 blades.

It would be a hard matter to say, what the proper speed and feed should be as a general rule, but we have run 1500 R.P.M. with 20" feed in a number of cases, others were dropped down to 730 R.P.M. and a 6" or 7" feed.

We have ground some of the corners of the cutters 45° while others have a double angle of 22½° off the face and the side. The latter seems to give us better cutter life.

With H.S. blades for the face mills we have found that 600 R.P.M. with 6" to 7" feed gives fairly good results. For milling cast dural we run about 350 R.P.M.—6" to 7" feed.

We have a P11953 cutter 12" dia. x 2½" wide made by National Twist Drill Co. with H. S. blades, the blades spaces 4" on the periphery running on a dural forging, climb milling, at 350 R.P.M. 10½" feed—straddle milling, removing 3/16" on a side 3¾" deep. This is being run on a No. 12-30 K. & T. Bed type Mill.

(Concluded Next Month)

SPEEDS AND FEEDS FOR CUTTERS AND MATERIAL

Type of Material	H. T. or otherwise	Dia. of Cutter	Width of Cutter	Speed of Cutter	Feed per Minute	Stock Removed
Chrome Moly	150,000	4"	4"	35 RPM	½"	⅛"
Chrome Moly	Normalized	8"	1½"	20	½"	3/16"
Chrome Moly	125,000	6"	½"	35	1"	2"
24 S. T. Dural	None	5"	1½"	220	2¾"	⅛"
Chrome Moly	150,000	5"	½"	23	5/8"	¼"
Chrome Moly	Normalized	10"	¾"	23	½"	2½"
Chrome Moly	Normalized	10"	2"	23	⅜"	3⅛"
24 S. T. Dural	None	6"	2"	167	1¼"	¼"
Chrome Moly	100,000	4"	3"	63	1"	3/16"
Chrome Moly	150,000	8"	1"	20	½"	3/16"
Chrome Moly	180,000	8"	¾"	23	½"	⅛"
24 S. T. Dural	None	8"	¾"	163	1¼"	¼"
Chrome Moly	150,000	1" end mill		96	5/8"	½"
Chrome Moly	150,000	½" end mill		114	5/8"	1/16"
Chrome Moly	150,000	¾" end mill		61	7/16"	3/8"
24 S. T. Dural	None	5"	⅛"	285	2"	⅛"+1-1
Chrome Moly	150,000	4"	3/16"	35	½"	1"
Chrome Moly	100,000	12" Dia.	⅜"	20	½"	1¼"
Ch Ni Moly	150,000	4" face mill		35	½"	3/16"
Chrome Moly	150,000	6"	⅜"	23	7/16"	1¼"
Chrome Moly	180,000	6"	1"	23	7/16"	⅛"
Chrome Moly	150,000	6"	3/16"	20	7/16"	1⅛"
Chrome Moly	95,000	6"	½"	46	1⅛"	⅛"

NOTE: This is the second of a series of Data Sheets which will be published in THE TOOL ENGINEER hereafter. A handy three ring binder can be secured at any book, stationery, or dime store and will hold the sheets for convenient and frequent reference.

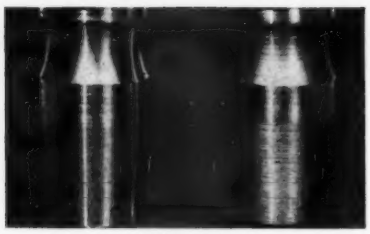


Figure 1
Tie Rod Pins A (left) and B (right)

Developments in carbide tools make them practical for new steel cutting applications. Here is an analysis of recent applications and suggestions upon proper carbide tool use.

Steel-Cutting Carbide Tools

By GAYLORD G. THOMPSON
McKenna Metals Company
Rockford, Ill.

PRIOR to the drastic cut in prices of carbide tools in the fall of 1940, many Tool Engineers steered clear of carbide tools because of their cost. When carbide tools were mentioned, the word "Gems" crowded into the mind as synonymous. If a carbide tool was bought and then accidentally broken in use—well—the unrestrained publicity which catapulted from that broken tool would send every Tool Engineer scurrying behind the walls of retrenchment and woe to the carbide tool sales engineer when he returned. Herein is born the old resistance to carbide tools.

Now that prices have been adjusted on carbide tools so that they compare more favorably with the initial cost of high speed steel, many Tool Engineers are becoming more interested.

Very often, Tool Engineers will mention with incredulity, some specific problem of carbide tool application which he thinks will stump the carbide Tool Engineer. These problems are variable and can be listed under such headings as Breakability; Class of Finish Produced; Automatic Machines; Bar Work with Roller Turners; Stamina and Interrupted Cuts; and the Retention of Tolerances on Dimensions.

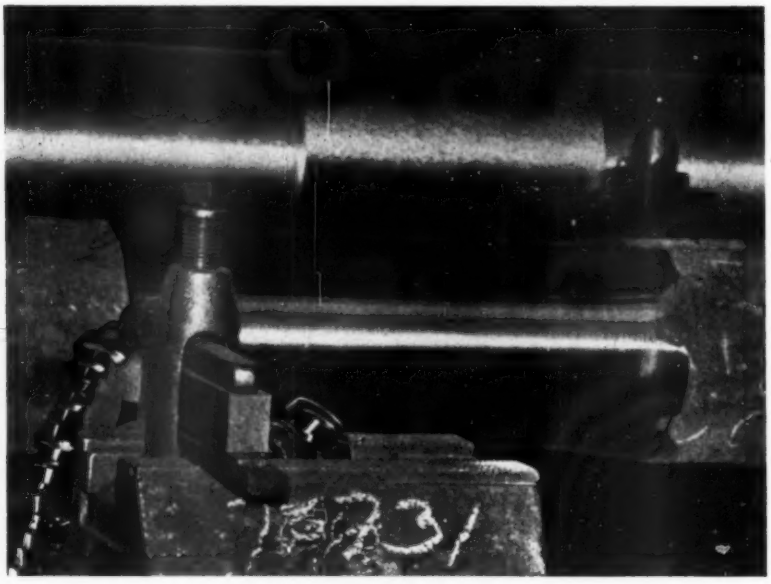


Figure 2
Foreground: Carbide Tool; Rear: High Speed Steel Tool

Breakability

Steel-cutting carbide tools are available today that have a capacity for greater speeds and feeds than the original tungsten carbide mixtures with titanium known as Widia X and XX in Germany. The new American composition WTiC2 has over 50% greater strength as measured by transserve rupture tests. This steel-cutting carbide, a tungsten-titanium composition, is sintered in an electrically heated vacuum furnace. The vacuum feature prevents formation of oxidation during the sintering process which might tend to weaken the carbide blank.

Thus we have a steel-cutting carbide tool that does not "gall" nor "crater". It will cut steel from 167

Brinnel to 552 Brinnel. A tool was turning a forged steel shafting at the rate of 350 feet per minute with a depth of cut ½" and a feed of .030". The machine was purposely stopped seven times while the cut was in process and no damage was done to the tool.

Class of Finish

The steel-cutting carbide tool must run from two to five times as fast as high speed steel to get the best results in finish and length of performance between grinds. Unorthodox as it may seem, you often have to speed up the R.P.M. or cut feet when the tool dulls too quickly. When material "stacks up" on the tool, this too is evidence of too slow a speed. On some straight tungsten-carbide tools the build up is often a natural consequence of "cratering".

One of the most prominent errors in the application of the steel-cutting carbide on finishing cuts is that insufficient stock is left for the finishing cut. The carbide tool must have its nose buried into the steel at all times and operated at an exceptionally high cut-feet rate. When insufficient material is left for finishing, there is a lapping action encountered and consequently a dull tool.

Figure 1 shows two tie-rod pins made of SAE-3120. The pin on the left, (A) was machined by the non-galling steel-cutting carbide tool. Note its smooth finish as compared to the pin on the right, (B) which was turned with a straight tungsten carbide tool. The non-galling properties of the steel-cutting carbide makes that difference in the finish. The work was run at a speed of 400 cut-feet per minute with .003" feed and finishing 500 to 1000 pieces per grind of tool. A good example of tool performance.

Figure 2 shows a close-up of two engine lathes. The first lathe has the carbide tool in action while the one in the rear has a H.S.S. tool. Both are turning shafts. Note the difference in the finish of the two shafts. The carbide tool was cutting at the rate of 150 feet per minute on SAE-4120 forgings, with 1/16" feed and from ¼" to ¾" depth of cut. The H.S.S. was cutting at the rate of 35 feet per minute.

Automatic Machines

Full automatic machines are not a very fertile field for the application of carbide tools on steel work. The number of tools working simultaneously, together with the number of machines operated by one mechanic, creates an efficient condition that's hard to overcome by tools alone. Furthermore, the speeds of the full automatic machines are limited by their very designs.

Semi automatic machines however, are more susceptible to the application of steel-cutting carbide tools. Two examples are illustrated in *Figures 3* and *4*. These help to prove the sustaining qualities of the carbide tool in repetitive work on dimensional limitations.

Figure 3 shows a Fay-Automatic machine turning out Garand rifle barrels. The tools operate at 200 feet per minute at ⅛" depth of cut. The tools are reground every 200 pieces which is equivalent to 2400 rifle barrels completed per each replacement of tools.

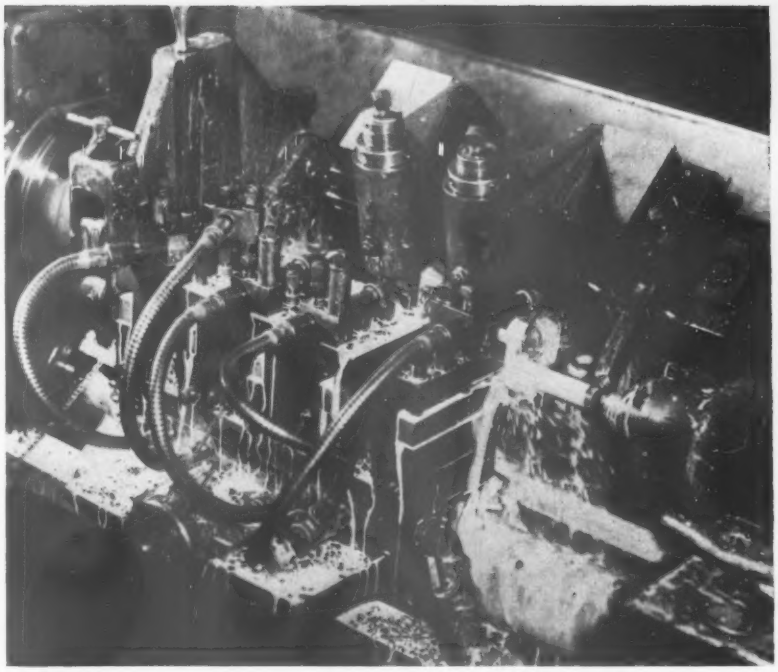


Figure 3
Fay Automatic turning Garand rifle barrels.

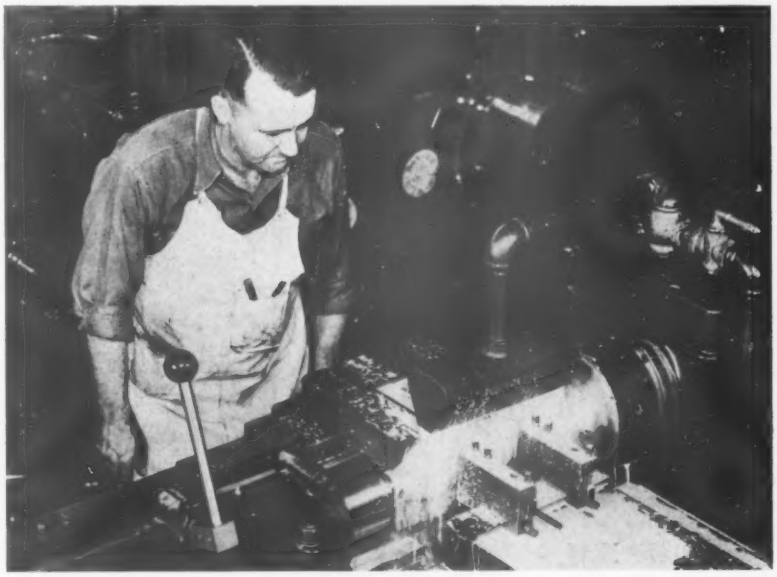
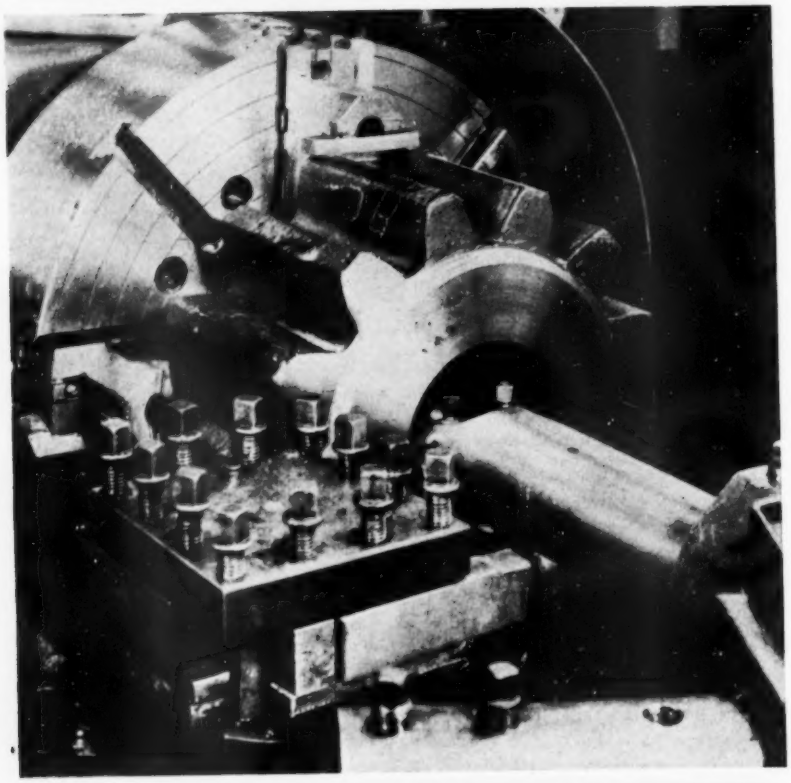


Figure 4
Sundstrand finish-turning a 70 mm. shell.

Figure 5 (Top)
Locomotive frame bolt and tool.

Figure 6 (Center)
Interrupted cuts on a Warner & Swasey.

Figure 7 (Bottom)
Interrupted cuts on square washers.



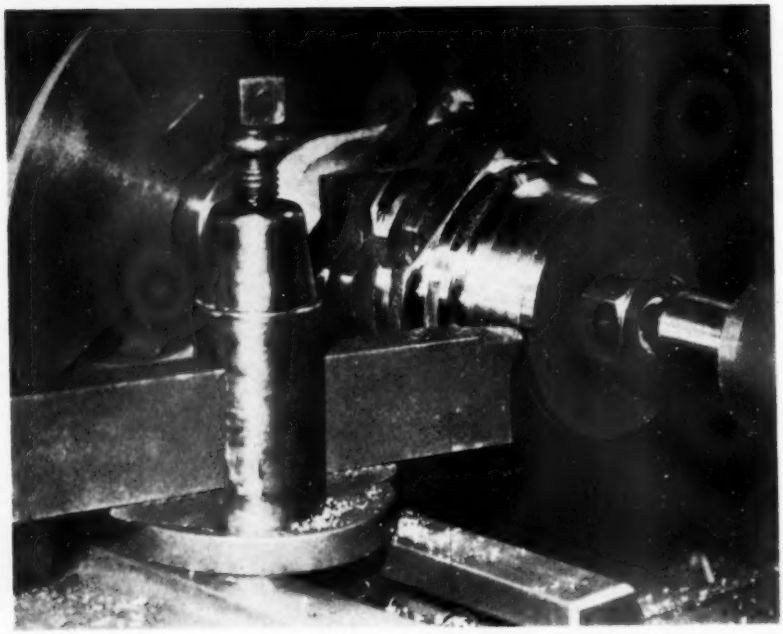


Figure 4 shows the rear view of a Sundstrand No. 12 machine finish-turning a 90 MM shell. The set of five tools operate at a speed of 325 feet per minute at a feed of .017". From 250 to 400 shells are machined between tool sharpenings and very seldom are tools sharpened more than once in eight hours of production.

Bar Work

Bar stock work on which thought was given to the use of carbide tools in the roller turners was discouraged. The long overhanging stock characteristic of bar stock work was of course, lacking in the stability so necessary for the efficient performance of carbide tools. The stock was "packed" with chatter—and that was poison to the tools. Now, with the hard and tough steel-cutting carbide tool this tool has become so common that it is a catalog fixture.

Figure 5 shows the head end of a locomotive frame bolt and the carbide tool which did the work of turning the 1¼" dia. x 18" long bolt in ONE CUT from SAE-2115 H.R. 2" hex. stock. This was done on a Warner & Swasey No. 1-A turret lathe using .012" feed. The finish was so smooth that the bolt appeared as though ground. This bolt was on exhibition at the last A.S.T.E. show in Detroit.

Interrupted Cuts

Before the birth of the WTiC2 tungsten - titanium carbide, carbide Tool Engineers turned thumbs down on any job that savored of interrupted cuts. And many do this very thing today!

The three illustrations *Figures 6, 7,* and *8* are just a few of the many examples of the carbide tool working on interrupted cuts.

Figure 6 shows a cast steel pinion chucked in a Warner & Swasey No. 3-A machine. Analysis:

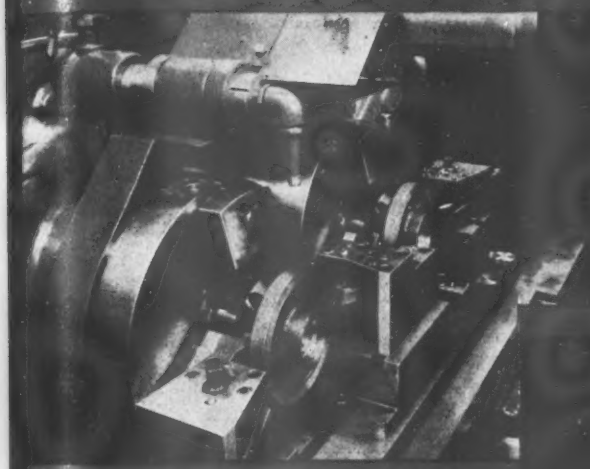
C .25/.35
Ni. 1.50/2.00
Cr. .60/.90

Tensile strength—90,000 lbs. per sq. inch.

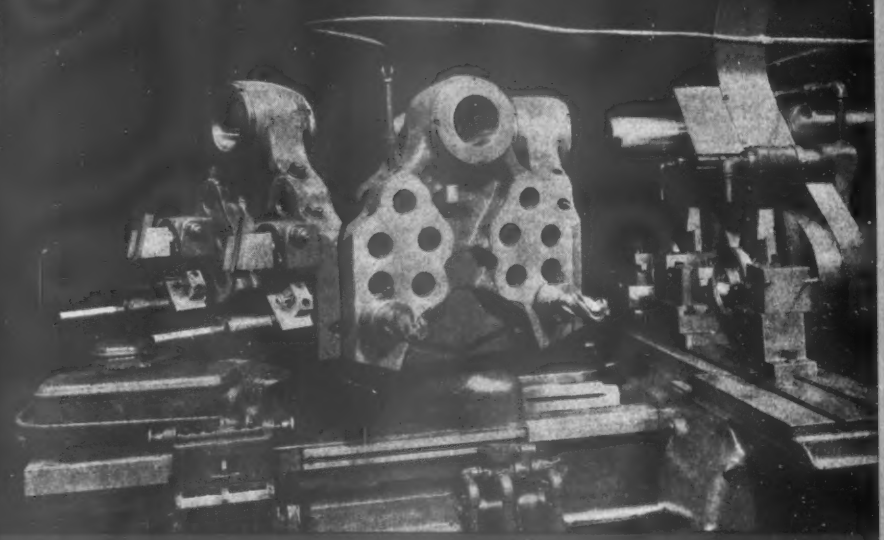
The carbide tool performed the operations of boring, facing, and turning over interruptions and sand holes at the rate of 155 feet per minute with .032" feed and from ¼" to 5/16" depth of cut. This performance outproduced H.S.S. five to one.

Figure 7 shows another style of interrupted cutting being done on square washers. These washers are

2 SPINDLE OUTPUT FROM SINGLE SPINDLE FLOOR SPACE



5-D 2-SPINDLE



PRODUCTION DETAILS . . .

Part: Tractor Steering Clutch Driving Gear
Material: Steel Drop Forging — SAE 3115
Machine: 5-D Two Spindle Powerflex
Operations:
1st T.F.: Core drill hole (hole pierced)
2nd T.Fs: Rough bore hole; rough face one end of hub; rough turn O.D. of gear; rough face both sides of gear at rim.
3rd T.F.: Finish cuts as roughed on 2nd T.F.
4th T.F.: Ream hole 1.488 dia.
Machining Time: One operation only — two subjects 4.88 min.
Floor to Floor Time: 5.38 min.
Production: 17.8 pieces per 51-min. hour.

Increased output together with savings in power, floor space and initial investment are outstanding advantages offered in P&J 2 Spindle Automatic Chucking Machines.

Where there is an approximate balance as to diameters and length of principal cuts, these P&J machines perform two operations simultaneously on identical subjects. Two quite different holdings can also be performed. A cross slide unit mounted under chucks provides for rough and finish facing cuts or the operation of slide tools mounted on turret.

The job illustrated here and being performed on the P&J 5-D Two Spindle Powerflex, consists of machining gear blanks from drop forgings in substantially one holding, leaving only broaching and final finishing operations to be handled prior to the cutting of teeth. Extreme rigidity of headstock and turret slide which are tied together while machine is under cut result in maximum cutting speeds and feeds, fine finish and high accuracy. A rugged overhead pilot, hardened and ground liberally dimensioned ways and a turret automatically bound after indexing, contribute to maintenance of accurate work and minimum down time for tool replacements or machine maintenance.

All these desirable qualities are inherent in the entire line of P&J Single and Two Spindle machines.

POTTER & JOHNSTON MACHINE CO.

Pawtucket, Rhode Island

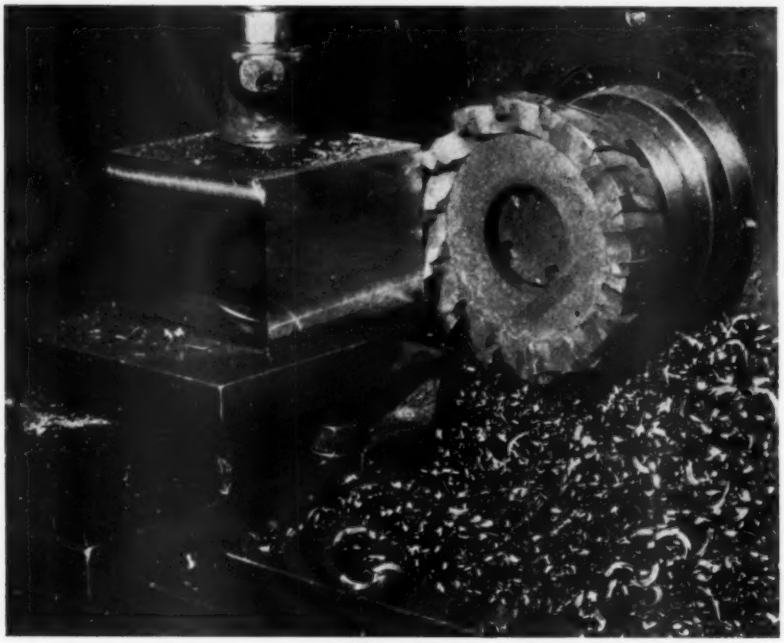


Figure 8
McCrosky Cutter on a Cincinnati Milling Machine

made from Maxell No. 7 steel bar stock 7/32″ thick. They are cut off in stacks 3″ square on power saws—then drilled in stacks—then stacked on the arbor and the 3″ squares turned down to a round diameter of 2⅞″. This method of making washers with the use of the steel-cutting carbide tool performed the work cheaper and better than blanking. There were no distortions and the washers remained flat. Three cuts were taken across the corners at an average depth of 3/16″. The feed was .008″ and the speed 335 feet per minute. One finishing cut was taken ⅛″ deep with .008″ feed. It was calculated that this tool took an average of 5436 bumps on the cutting edge before resharpening was necessary.

Figure 8 shows another form of interrupted cutting which tests the stamina of the carbide tool. This McCrosky 7″ milling cutter with carbide tipped blades and operating on a Cincinnati milling machine, faced 160 faces of 4-way steel tool blocks. The material was SAE-4150. The speed of cutter, 180 F.P.M. with 3⅝″ feed per minute and ⅛″ depth of cut.

Figure 9 is a boring mill job. It shows the carbide tool plowing its way down into the sinister looking 23½″ diameter maw of "something or other" made of SAE-1040 steel. A 10″ square ram is supporting—pushing—shoving that carbide tool at the rate of 1/16″ feed on a cut ⅜″ deep while the maw twists and squirms past the tool at the rate of 120 feet per minute. And that steel-cutting carbide will live through that experience to tackle some more tough and similar assignments.

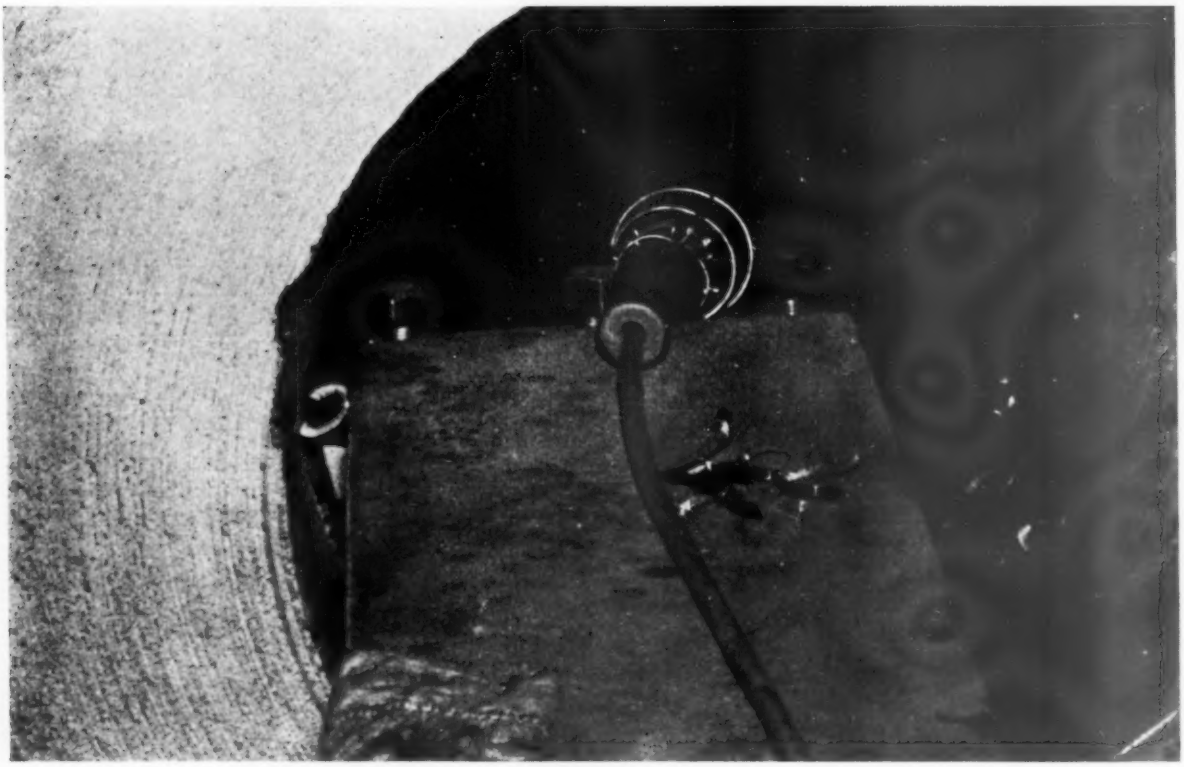


Figure 9
Carbide tool on a 10″ ram holder used in a boring mill.

Where Haste Makes Waste . . .

As any skilled workman knows, toolmaking is a matter of infinite patience and scrupulous accuracy. No jeweler fashioning some beautiful but useless bauble ever worked with greater care than do the craftsmen who make the Starrett Precision Tools which are so essential to modern industry.

It is a job that can't be rushed. Greater efficiency, new methods, additional equipment and the employment of every available trained and experienced toolmaker help a lot, but time is still the essence of accuracy.

If your tool dealer is unable to supply you promptly with the Starrett Tools you need, remember that we who make them must still work carefully and slowly in order that you who use them may work swiftly, surely and confidently.

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STARRETT TOOLS

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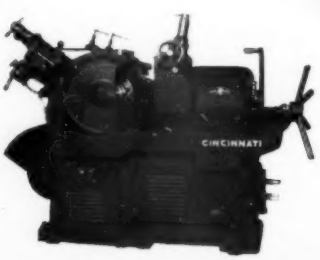
Operating a CINCINNATI Centerless Grinder is just about as simple as operating household equipment. Once set up, there's little to do other than handle the work. Almost anyone can run the machine. The Centerless is safe, too. As soon as the work contacts the wheels, the regulating wheel takes over the job of feeding the work through the grinding throat (thru-feed jobs), reducing or entirely eliminating the necessity of placing the hands near the wheels.

Coupled with this simplicity of operation are the simple, rigid and compact working elements of the machine . . . FILMATIC Grinding Wheel Spindle Bearings, which never seem to wear out or require adjustment . . . hardened alloy steel gears and shafts . . . principally automatic lubrication.

These two qualifications — simplicity of operation — absence of service requirements — are highly important factors today in solving the production problems of your precision ground parts. The following publications will be of help to you in deciding which additional parts can be ground by the low-cost centerless method.

G-472 "Centerless for Small Lots"
G-456 No. 2 Centerless Catalog
G-438 No. 3 Centerless Catalog



Right: CINCINNATI No. 2 Centerless Grinding Machine. Also built in Nos. 3 and 4 sizes.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U.S.A.

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PRODUCTION PERSPECTIVES...

News of Mass Manufacturing Everywhere

THE Federal Reserve Board index of industrial production for October was 164 as compared with 161 in September and 130 in October 1940.

Machine tool shipments rose to $77,200,000 in October as compared to $68,700,000 in September and $64,300,000 in August, the National Machine Tool Builders' Association reported. In October a year ago shipments were estimated at $49,000,000.

The October shipments indicate that the industry will exceed its announced goal of $750,000,000 in 1941.

The Office of Production Management recommended Oct. 27 at Washington that the RFC finance construction at South Chicago, Ill., of the first plant in this country specifically designed to produce electric alloy steel. Republic Steel Co. will operate the plant. The new installation, part of a steel industry expansion program approved by OPM, will have a capacity of 504,000 tons of alloy steel ingots a year. Of this amount, 317,000 tons will be converted at the plant into bars, rods and shapes to be finished elsewhere into aircraft and ordnance parts. First units of the South Chicago plant can start production in eight or nine months and the entire plant can be in operation in about 15 months, it was estimated by W. A. Hauck, OPM steel consultant whose report on the project formed the basis for the recommendation of OPM Director William S. Knudsen.

The National Association of Manufacturers claimed that a total of 3,408,160 man-hours of production was lost the preceding week as the result of strikes in nine key defense industries. In a tabulation labeled "strikes as usual," the N.A.M. said 73,910 workers were affected by the listed labor troubles the preceding week, and it added that "strikes in this, the first full year of the defense program, seem likely to equal or exceed the all-time record of 1937." "Man-hours lost due to strikes at shipbuilding plants alone last week amounted to 396,800 hours, the potential work time to build two and three-tenth 170-foot steel submarine chasers," the N. A. M. said.

Overall output of American industry is expected to show a 25 per cent increase over 1940, an estimate by government experts shows. Measured by the Federal Reserve Board index, the output will rise from 139 to nearly 175 per cent of the 1935-39 average. Defense industries, particularly airplanes, will show output increased much faster, but consideration must be given to curtailment of civilian lines due to priorities on materials. Before the European war started, the index stood at 105. It reached 161 in September and is still rising.

UNFILLED orders on books of manufacturers declined 1 per cent in September, first recession in backlogs in 18 months, the National Industrial Conference Board reported. The board's adjusted unfilled orders index dipped from a high of 537 in August to 534 at the end of September, but remained 171 per cent above a year ago. Lower orders and increased shipments combined to reduce the backlogs of unfilled orders of durable goods, while non-durable goods' backlogs were about unchanged.

The National Association of Manufacturers warned Nov. 11 at New York that further wage increases were likely to cause a difficult adjustment period after the war, with wage rates far disproportionate to purchasing power. An association survey said higher hourly wages would foster price inflation and that any attempt to control prices of manufactured products without stabilizing wages would be a serious threat to manufacturers. From 1929 to 1940, the survey showed, labor costs per man-hour rose 20 per cent, while output increased 40 per cent.

Richard Frankensteen, director of the United Automobile Workers' (C.I.O.) Chrysler division, on Nov. 19, announced union ratification of a new contract ending a strike threat at Chrysler's $20,000,000 tank arsenal. Frankensteen, speaking from the floor of the fourth annual C.I.O. convention at Detroit, said the contract had been ratified by 6000 employees at the arsenal near Centerline, Mich. The contract, which expires in November, 1942, provides for wage increases of 3 to 18 cents an hour for 3000 of the 6000 workers, Frankensteen said. He said another wage increase would be given in June, 1942, under agreement terms. "This assures the continued flow of 32-ton tanks for the Army," Frankensteen said. The arsenal produces eight to 10 medium tanks daily.

A new and lighter shade of "machine tool gray" has been endorsed by the National Machine Tool Builders' Association as the standard finish for machine tools, the Association announced recently in a bulletin to Association members.

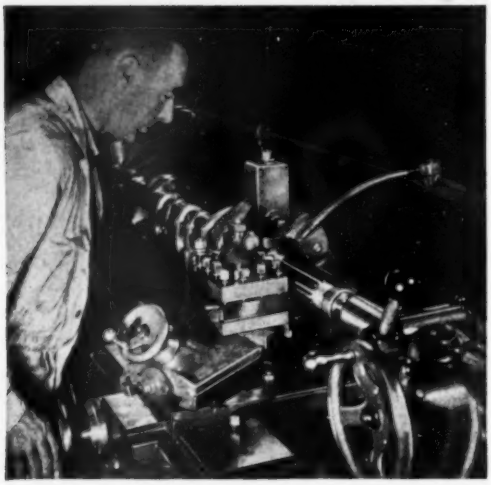
The 1,700-ton destroyer U.S.S. Laffey was launched Oct. 30 at San Francisco by the Bethlehem Shipbuilding Co., first of 14 Bristol-type destroyers being constructed at the plant.

Bernard M. Baruch, chairman of the World War Industries Board, on Nov. 19 suggested that production of the "bare necessities" of life, including clothing and housing, be standardized during the emergency to wipe out the added cost of turning out varied styles and colors. Baruch made the suggestion in a letter to Representative Albert Gore of the U. S.

MODERN DESIGN

Drawn for THE TOOL ENGINEER by Ted Petok

NEED PRODUCTION?



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LATHES

——PRODUCTION PERSPECTIVES——

House Banking Committee, in which he reiterated his support of Gore's plan for an over-all ceiling on wages, rents, prices and profits. Baruch proposed that the Office of Civilian Defense select a product and prescribe four standardized styles for it. Citing the example of shoes, he said the effort would be "to produce standardized, serviceable, good-looking shoes at prices lower than prevail now." "The shoes," he said, "could be classed as A, B, C, and D with the notation of the class and price stamped on them. After a certain date, no shoe, other than these, should be sold. Being made in mass production, with limited styles and colors, the cost would be low." Warning that "delay is dangerous," the 71-year-old industrialist pleaded for enactment of strict price control legislation to include regulations of wages and farm prices —the center of dispute on the bill now under consideration.

The opening of a new plant at El Monte, California, signalizes the expansion of Littelfuse, Incorporated, Chicago concern internationally known manufacturer of small electrical fuses and fuse mountings for instruments, aircraft. radio, etc. The California plant supplements the Littelfuse factory at Chicago, Illinois, excess demands on which have made necessary a large increase of production facilities as rapidly as possible. The California plant in fine new buildings was in full operation November 1, 1941.

Production on Army orders for 18,600 light reconnaisance cars soon will reach 400 a day, J. W. Frazer, president of Willys-Overland Motors Inc., said Nov. 10 at Toledo.

THE Van Norman Machine Tool Company of Springfield. Mass, reports that it has more than $6,000,000 worth of unfilled orders on its books and that the volume of incoming orders has reached an all-time high.

Carbide tools are doing more than their expected share in increasing defense productivity while simultaneously saving strategic tungsten in large amounts, nine months' figures just released by Carboloy Company, Inc., reveal.

Packard Motor Co. was awarded a $17,726,000 contract for engine parts by the War Department.

Value of military planes produced at Lockheed Aircraft Corp. for the first three quarters of 1941 was $99,000,000, Charles A. Barker, Jr., vice president, said at Burbank, Calif., on Oct. 28. Barker said Lockheed's subsidiary, Vega Airplane Co., produced planes worth $4,000,000 during the period.

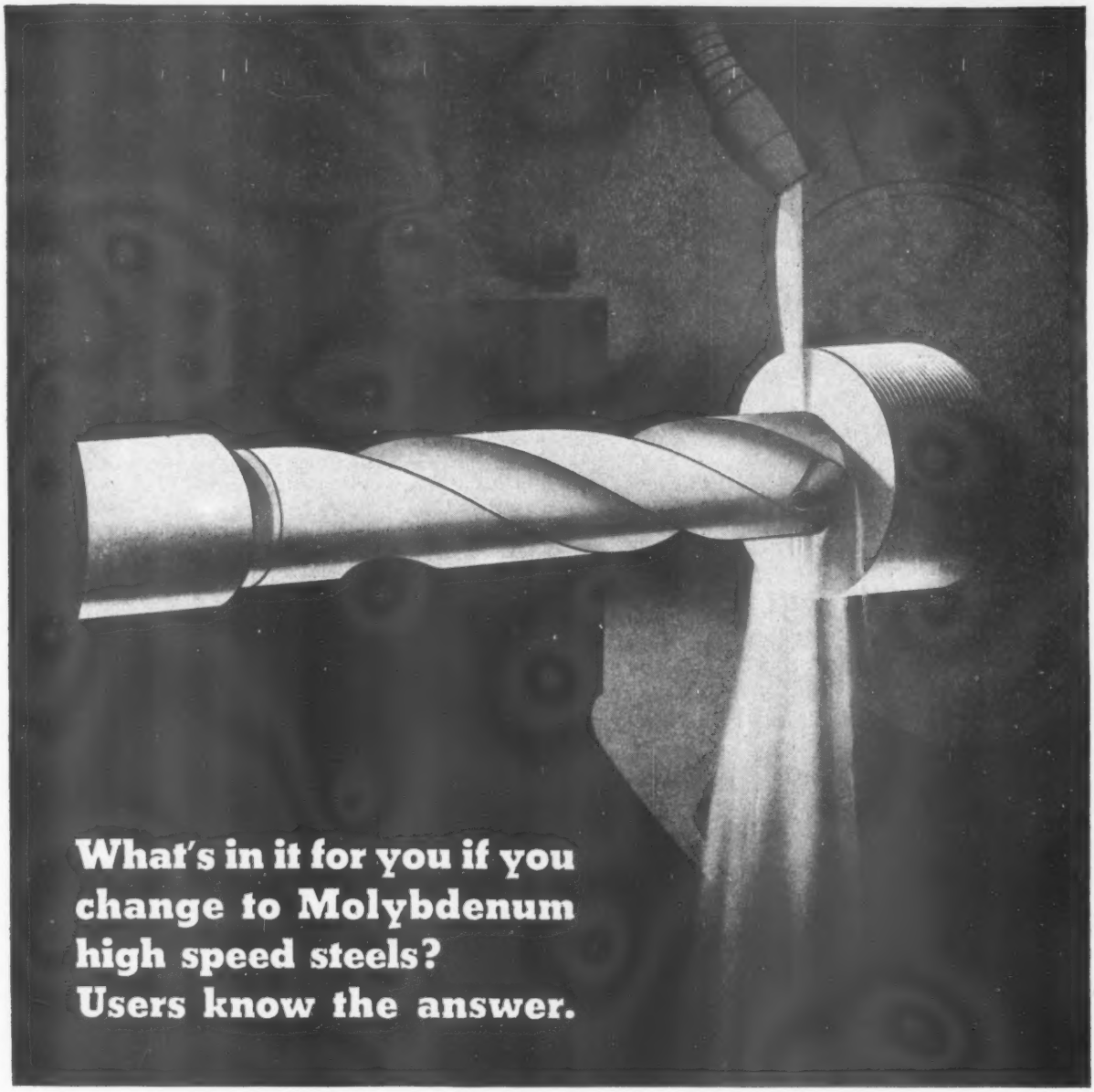
A new supply of stainless and alloy steels for the defense program was opened up Oct. 28 at Chicago when two new electric furnaces with an annual capacity of about 100,000 tons were brought into production at the South Chicago Works of Carnegie-Illinois Steel Corp.

Priority rating to obtain 1800 tons of steel, iron, and copper, needed to construct a glass plant, at a cost of $1,800,000, in Fairmont, W. Va., has been granted Westinghouse Electric Manufacturing Company by the Office of Production Management, Washington, David S. Youngholm, Westinghouse vice president announced. The OPM decision is based upon the factory's importance to national defense.

The Defense Plant Corp. signed a contract with Youngstown Sheet & Tube Co., Youngstown, Ohio, for construction and equipping a steel ingot plant at Indiana Harbor, Ind., to cost $1,900,000.

To supply stock for the manufacture of forgings for airplane motors and fittings, and rod, bar and wire for national defense industries, R. T. Whitzel, superintendent of the Massena, N. Y works of Aluminum Company of America, has been advised that the Company plans to erect a second blooming mill at Massena.

The Giern & Anholtt Tool Co. Detroit, Mich. is building an addition to their present plant 30 by 200 feet. The new building will be mainly used as an erecting shop for heavy



There are three good reasons for changing to Molybdenum high speed steels.

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2. Better toughness.
3. Lower cost.

The three advantages combine to reduce machining costs. Confirmation is found in the experience of thousands of shops that have changed over from Tungsten high speed steels.

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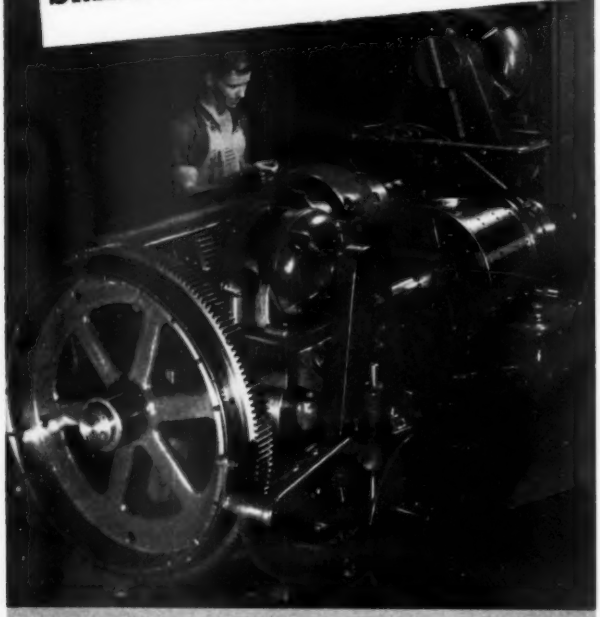

• In lots of 200 to 500 pieces, holding close tolerances, shop records at the Kingsbury Machine Tool Company, Keene, New Hampshire, show that their new 3¾-inch capacity Model A Cleveland *Single Spindle* Automatics have *doubled their production* of parts for their own line of full and semi-automatic drilling and tapping machines. In the 3¾-inch to 8-inch size Cleveland Model A machines, four-speed motor drive with universal camming and variable tool feed is standard equipment. Model A machines of 5/16-inch to 2½-inch capacity have constant speed drive, but from 1 1/16-inch to 2½-inch capacity two-speed drive is optional at slight additional cost. Ask for more particulars about these Model A Clevelands in the sizes of interest to you.

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duty carbideborers, in which line the company is deeply engaged for defense purpose.

The complete line of Modern Motor Drives formerly manufactured by Quality Hardware and Machine Corporation, Chicago, are now made by Modern Motor Drives, Inc., Elkhart, Indiana.

The 21st Anniversary of the Ohio Crankshaft Company of Cleveland was celebrated Tuesday, November 18, 1941, by a special anniversary luncheon and the first official inspection of the company's new $4,500,000 subsidiary defense plant, Ohio Crankshaft, Inc., which is producing crankshafts for Wright 14-cylinder Cyclone motors.

In anticipation of receiving final confirming orders from Washington within the next few days, crews began clearing ground for the new $9,066,000 supercharger plant of the Allis-Chalmers Mfg. Company. Its completion in about six months will give Milwaukee its first real blackout factory.

Joseph W. Frazer, president of Willys-Overland Motors, announces that his company has already developed a new line of "chromeless automobiles" in compliance with the recent OPM edict prohibiting the use of bright metal trim after December 15th.

He said his engineers have been experimenting for months on the use of colors instead of shiny metal and, as a result, have developed new "colorized" treatment of grilles, hub caps, trim and other parts. Dark shades are contrasted against light body tones and light color trim against dark surfaces, with two-tone body treatments and new striping affording contrast and high lights.

Brig. Gen. Gilbert H. Stewart, commanding officer at the U. S. Armory at Springfield, Mass. stated that the armory has spent $1,500,000 during the past two years to expand and renovate its physical property.

Twelve new buildings have been constructed and eight old buildings have been completely renovated.

F. C. Kroeger, general manager of the Allison division of General Motors, Indianapolis, Ind., said Nov. 18 that Allison engines which have not already been installed in airplanes are being recalled for an inspection of bearings by a new process announced the previous week. Mr. Kroeger explained that since the new inspection process had proved so satisfactory it was decided that it would be well worth while to check over these motors. Some engines have been recalled from the Curtiss-Wright Co. and Bell Aircraft of Buffalo, he said.

A $20 million plant at Canton and an $11 million plant at Louisville, built by Westinghouse, are now in production of gun mounts and other ordnance equipment for the Navy eight months after ground was broken for their construction.

Two new production units to increase the nation's supply of special steels by 50,000 tons a year have recently been completed by the Allegheny Ludlum Steel Corporation. They are a rolling mill at the West Leechburg, Pennsylvania plant, and an addition to the electric furnace department at its Brackenridge, Pennsylvania plant.

The Sheldon Machine Company have moved into their modern new monitor type daylight plant just completed at 4240-58 Knox Avenue, Chicago. This new plant has tripled Sheldon's lathe production.

Warner & Swasey Company on October 17 reported net profit for the third quarter of the year of $1,181,482, a new high for the period and almost double earnings for the same quarter last year. In the second quarter this year net was $1,263,356, and in the third quarter of 1940 amounted to $668,855.

Increased demand for its line, particularly its larger sizes, has caused The Ohio Machine Tool Company, of Kenton, Ohio, to add to its facilities. Assembly floor area has been more than doubled, and loading and shipping space increased.

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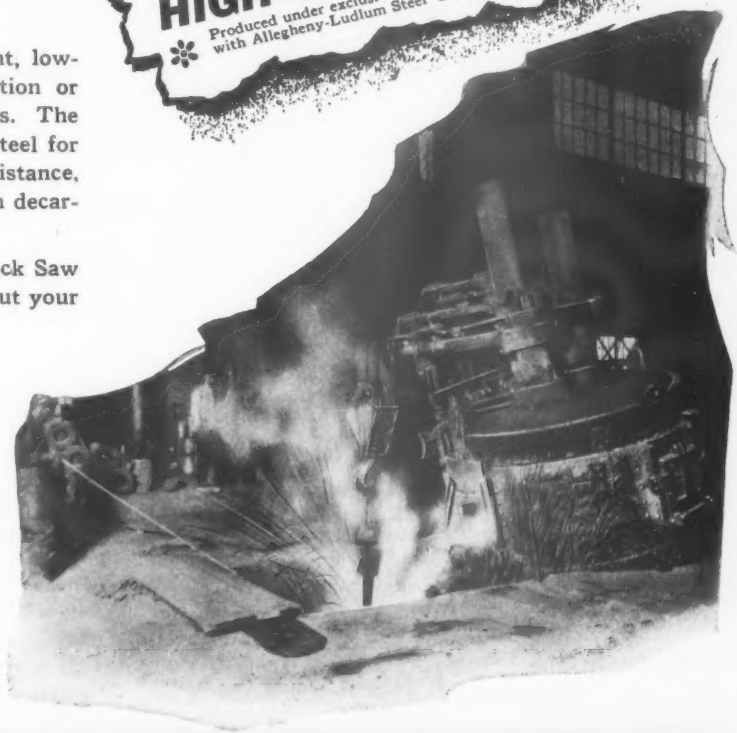
Specify Ingersoll D-B-L on orders for Hack Saw Blades, and see for yourself how it will cut your bills.



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Emergency Training Program Starts Tool Engineering College Courses

By OTTO W. WINTER
1st Vice President, A.S.T.E.

AT the present time attempts are being made in connection with the defense training effort in practically every engineering college in the country to teach Tool Engineering and/or Tool Design. Some schools offer only the latter subject and attempt to cover some of the former in the same course. Obviously this is extremely wrong and can only sketchily hit high spots of both subjects. Other schools offering both subjects apparently recognize the difference but are open to considerable question as to course content of both subjects and particularly that of Tool Engineering.

The courses are being financed with federal money thru the U. S. Office of Education. As Tool Engineers we should definitely interest ourselves in the quality and content of such courses and assist in setting them up on a proper basis. The Emergency Defense Training Committee of the A.S.T.E. finding such assistance one of its prime objects has undertaken a study of such college level defense training in an effort to assist and improve.

Briefly we find that there is a great lack of suitable teaching media in the fields of Tool Engineering and tool design. We find both competent and incompetent instructors. It is obvious that college faculties without adequate industrial experience are not technically competent to teach the applied subjects of the Tool Engineering profession. We find that technically competent and experienced Tool Engineers, to use the vernacular "know their stuff but can't dish it out." Both badly need suitable instructional material, bibliographical references, lessons and quiz outlines as well as complete and comprehensive subject outlines and guides. The deficiency of both types of instructors would be greatly reduced by such material. The faculty member who knows how to teach would have a source of technical information from which to draw, the trained Tool Engineer would be better able to present his subject in a thorough and logical manner avoiding overstressing of non-important (and often pet) points and missing other items seemingly too elementary for his class. Both of these latter failures prevail. An experienced engineer always spends more time on some phase of the subject he is most familiar or experienced with. He also usually presumes his audience knows certain details which often they do not. The experienced Tool Engineer who is also a good and thorough teacher is the exception to the rule.

A great many sins, rackets, and wastes are being committed these days in the name of defense training. There is a lot of paper, ink, and celluloid wasted in haphazard, incomplete, and sketchy efforts to provide something to fill the need. Many of these efforts are purely commercial in aspect or are sheer sales propaganda. Some are not. It might be said however that all efforts in this direction do some good and like charity or religion, every little bit counts even tho the job isn't complete. Nevertheless with time so short and valuable it is important that all training effort be made as efficient as possible.

On the subjects of elementary machine shop practice, blue print reading, shop mathematics, elementary heat treating and inspection, a good job has already been done. This material prepared by a combination of experienced practical men and trained educators by the Vocational Education Department of the New York State Department of Education is being distributed by the A.S.T.E. Emergency Defense Training Committee at cost to any school or plant defense training project needing such material. (For further information write A.S.T.E. headquarters at Detroit). This material is being used extensively and successfully. It is doing a good job of making up for the deficiencies of instructors outlined above.

At present there is under way at Rochester, N. Y. a similar project on elementary jig and fixture design. This project involves several A.S.T.E men and is enjoying the full cooperation and attention of this committee. The material when available will fill an awful gap and present desperate need.

College Training

This committee is recognizing the need for similar material for Tool Engineering training at the college level, has undertaken an extensive and comprehensive review of all existing literature on the subject. This comprises the review of some 450 volumes on the various subjects in the field of Tool Engineering. The subjects being reviewed are applied ones only i.e. such general subjects as mathematics, chemistry, physics, etc. are not included. The ten subjects being reviewed consist of seven primary and three related as follows:

Primary Tool Engineering Subjects

1. Machine shop practice and Cutting Tool Design. Includes: Machine Tool Design and Application, Science of Metal Cutting and the more advanced aspects of machine shop practice.

2. Jig, Fixture and Gage Design and Practice. As related primarily to machine shop and assembly operations.

3. Sheet Metal Work and Die Design. Covering all types of sheet metal fabrication.

4. Forging Practice and Die Design. Covering all types of hot and cold forging, upsetting, extrusion, etc. with particular reference to equipment and tooling.

5. Permanent Molding-Plastics and Die Castings. With particular reference to equipment and dies as well as secondary operations.

6. Welding Methods and Equipment. With special reference to machine welding such as spot, butt, flash, seam projection, etc. Arc and Oxy-Acetylene welding studied primarily

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Group of dies and stampings (right) at Liberty Tool & Die Co., Rochester, N. Y. gives an idea of variety of jobs handled on their DoAll.

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in connection with machine and tool application; likewise flame cutting and flame hardening, etc.

7. Manufacturing Analyses. A composite yet specific Tool Engineering subject embracing the fundamentals and essential parts of cost accounting, work routing and planning, operation analysis, time and motion study, etc. The subject as approached by the Tool Engineer to find in monetary, as well as practical, values the best way to do the job.

Related Tool Engineering Subjects

Must be understood by the Tool Engineer but only in part. Covered thoroughly in other branches of engineering.

1. Metallurgy and Heat Treating. Enough to select materials for tools and equipment, plan heat treating operations and understand metal cutting, forming and forging.

2. Foundry Practice and Pattern Making. A specialized subject not involving tooling as such to a great extent. Nevertheless must be generally understood by the Tool Engineer.

3. Machine Design and Applied Mechanics. While usually considered 2 separate subjects can however be combined for the purpose of the Tool Engineer. Fundamentals and phases applicable to tool and special production machine design should be covered.

The impartial, unbiased review of existing literature under these 10 subjects will serve as a means of assisting current Tool Engineering defense training effort by determining the best of available literature and recommending its use.

Concurrently with this there will be set up subject outlines to be used as teaching guides. These outlines will carry bibliographical references and in some cases single texts may be recommended for an entire subject. Investigation to date however indicates that the use of a single book for any of the above 10 subjects is improbable because of incompleteness and obsolete contents of most books.

Complete Courses

As an ultimate step it is planned that complete course outlines will be prepared utilizing profuse bibliographical reference but at the same time containing a complete and thorough outline of the subject, teachers' guides, quizzes and certain text material.

In short we are, as practical and patriotic Tool Engineers, trying to do something to make up for the existing deficiencies in the defense training program and specifically in the available literature and instructional material on the 10 subjects of tool engineering.

It is intended that a number of competent men review each of the ten subjects so that a good cross section of opinion and coverage on the subject be obtained. There are few idle Tool Engineers these days and most are already burning a lot of midnight oil. Nevertheless this plea is broadcast for volunteers to assist in this important patriotic effort. For further information write A.S.T.E. headquarters or O. W. Winter, Chairman Emergency Defense Training Committee A.S.T.E., 907 N. Euclid Ave., Oak Park, Ill. Your assistance will be greatly appreciated.

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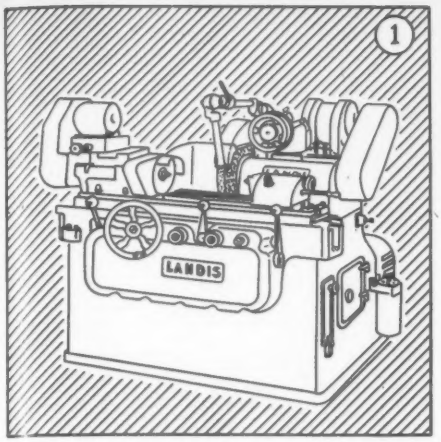
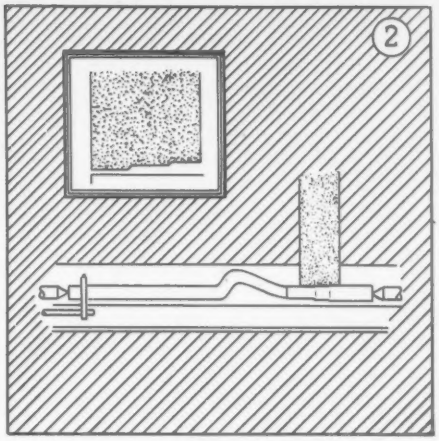


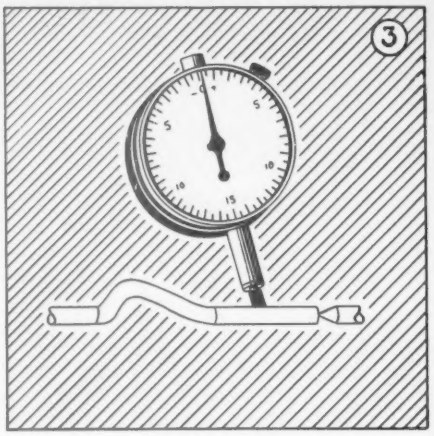
6" Type C Plain Grinder

This Landis 6" Type C Plain Hydraulic Grinder equipped with hydraulic straight infeed has been installed in the plant of a well-known manufacturer where it is being used to grind certain sewing machine parts, in this case a rotary arm shaft.



Grinding a Rotary Arm Shaft

In grinding this part the wheel is profiled as shown (exaggerated) in the insert above. The Landis hydraulic straight infeed and hydraulic table traverse combine to form a cycle rapid in production—close in accuracy. This cycle is discussed below.



Limits Are .0002"

In this operation close accuracy and fine finish are imperative; therefore this Landis machine must consistently grind within limits of .0002". From .006" to .008" stock is removed and the work is ground to size during one traverse round trip.

Landis HYDRAULIC STRAIGHT INFEED *scores again*

Every time the Landis hydraulic straight infeed has gone to bat for a manufacturer it has scored a hit. Not really a new feature of Landis machines, modern grinding demands have pushed it farther and farther into the bright circle of successfully engineered equipment.

In some instances where extremely slow and uniform feed is required it is practically a necessity for the successful grinding of a job. In other instances it so speeds up production and increases efficiency that it becomes insurance for profitable grinding.

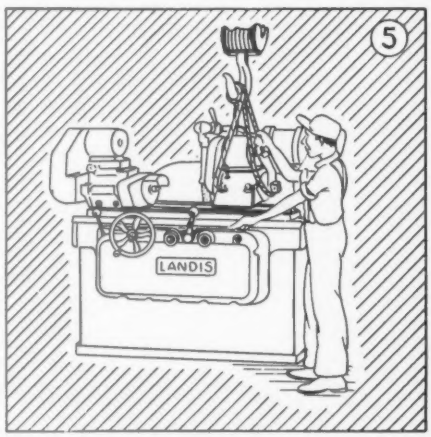
In the accompanying illustrations you see what does not appear to be a type of operation that would successfully utilize the Landis hydraulic straight infeed mechanism. Yet notice how this infeed peps up production when combined with hydraulic table traverse. First the wheel is profiled to three diameters. The wheel feeds straight in until all three diameters are removing stock and the largest is grinding to approximate size. The table is then traversed so that each diameter of the wheel removes its own small layer of stock. The largest wheel diameter, of course, still grinds approximately to size. At the end of this traverse the table is reversed and the largest diameter of the wheel on its return grinds within limits of .0002" to a fine finish. Only one traverse round trip is needed; then the wheel feeds rapidly back. The operation requires about 20 seconds—a production increase of 200% over former grinding equipment.

Is it any wonder then that so many men who know grinding are enthusiastic about the Landis hydraulic straight infeed? Give it a chance to go to bat and score a hit for you. At least write to us and find out more about it.

376

Production Increased 200%

The combination of Landis hydraulic straight infeed and hydraulic table traverse has enabled this machine to increase production 200% over former equipment. Each operation now requires only 20 seconds as compared to the 60 seconds required before.



Two Headstocks—More Jobs

And as though this fine performance were not enough, the machine is equipped with a special live spindle headstock which can be placed on the machine without disturbing the standard headstock. With this, two other sewing machine parts (including several eccentrics) can be ground.

LANDIS TOOL CO.

WAYNESBORO · PENNSYLVANIA

Training Personnel:

Industry's Task

By EDWARD KENNARD
Plant Manager, St. Catharines Steel Products Limited
St. Catharines, Ontario

Edward Kennard (Standing). At right, H. H. Kerr, Ontario Regional Director, War Emergency Classes

MOST War Emergency Training in Ontario, is carried on in accordance with two general plans; that which takes place as an extra activity in the Technical Schools, and that which is carried on within the industries. Because the school training operates on a much broader basis, we shall consider it first.

War Emergency Training in schools is a fundamentally sound attack, on the problem of getting people trained quickly. All types of activities thrive in the hands of specialists and in specialized environment. This applies particularly to education. War Emergency Training should be carried on in specialized surroundings, whether in some special department of a factory, or in a Technical School. Such an environment has the added advantage of being conducive to the formation of habits of orderliness and safety-consciousness. Those who experiment with the "stand by and watch" system of training, often report that they "started with one good man and one trainee, and ended with two orators".

The value of War Emergency Training to a manufacturer is determined largely by liaison, between the manufacturer and the school. A good deal of information must flow in both directions, and manufacturers contemplating personnel expansion involving the use of large numbers of trainees should assign good executive brains to the task.

The value of War Emergency Training also varies with the facilities available to the schools, so those desiring the unusual, should be prepared to assist the school, in procurement.

The War Emergency Training plan in the Technical Schools, was designed to assist the war industries by taking unskilled or unsuitably skilled men and women, and preparing them for semi-skilled operations. Actually, we have several departments in our factory manned exclusively by War Emergency Trainees, and supervised by qualified machinists who act also as Set-up men. These people, mostly girls, readily adapted themselves to operate any of our production machine tools, within a break-in time of a few hours, rather than days or weeks, as we otherwise should have expected. Their supervisors were pleased to find such new employees,

The war is a struggle between factory personnel of two groups of nations; the technical school is the training ground today.

able to read blueprints and micrometers, and generally deport themselves like mechanics.

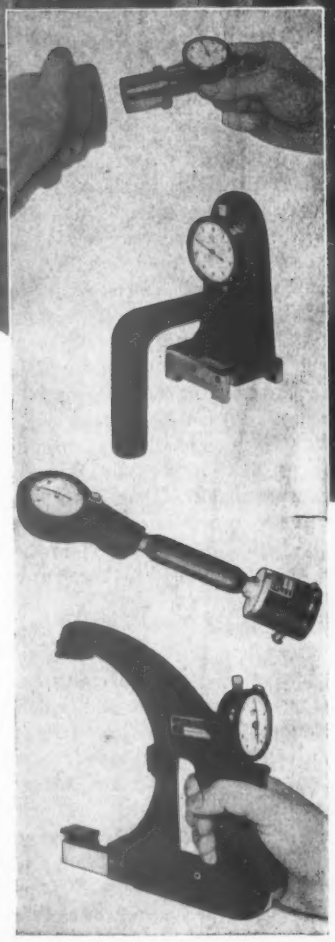
The liaison man of the industry, should outline a general educational program, and proceed with its execution, step by step. Complex tasks like these, can only be done by breaking them down, into series of simple little jobs.

A good practical procedure consists only of elementary principles, and is very similar, to a job of Process Engineering. In this case the "material" is men and women of all ages who, are available and trainable for the jobs which must be filled, and the "product" is graduated trainees, operating machines, doing inspection work, and many of the other allied tasks, which go to make up the activity of a war industry.

Classification

The first step should be to classify the jobs which are to be filled, and to estimate, how many trainees of each classification, will be needed. The men who design the processes to be used, in the new project, should have this information, as it is required in the other branches of Tool Engineering. The data of classifications, and numbers of trainees required, should be arranged in chart form, leaving space under each classification, to note further requirements.

The second step should be to estimate the rate of absorption of the new employees into the industry. This is very similar to scheduling material requirements, and may be retarded, or speeded up, from time to time as required. It is advisable to understate requirements, rather than overstate them, as, unlike steel bars and castings, War Emergency Trainees do not store well. For best results they must be put to work immediately they complete their courses. Previous experience should be the basis, for predict-



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At the right, are some of the gages for inspecting squareness of shoulder with hole; width between shoulders; diameter, roundness and taper of engine cylinders, and other types of bores, also a Snap Gage for outside diameters. Dial Indicators will speed up any inspection gage, and eliminate human variations. Write for catalog or information.

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ing future employment figures, during the build-up period, of a new project. In one industry we found it useful to make a graph of employment figures, while getting into production on a previous project. The totals of hourly-rated employees, determined the height of the graph line above the base line, which was laid out in time units. Then we noted the general shape of the graph line, and assumed it would apply in a very approximate way to a new project, which we were just beginning to undertake.

The third step should be to consult with the Director of War Emergency Training, at the nearest Technical School, lay out training courses which will produce each classification of help shown on the chart, and arrange for the co-operative selection of trainees.

Selection

Trainees should be selected very carefully, because those of higher intelligence levels are badly needed for the more difficult tasks which cannot be satisfactorily performed by the duller selectees, while these same higher types would perform very poorly in more menial occupations. There are also differences in preference and aptitude for certain classes of work, such as hand work, machine operation, and inspection. We note in passing, that the War Emergency Training Plan performs another service, by sorting out misfits, before they have an opportunity, to become expensive mistakes in industry.

The fourth step is to chart the minimum requirements for selectees, under such headings as Age, Health, Sex, Craft Sense, Intelligence, and General Education. These selection requirements, will vary for each classification of help such as Inspection, Lathes, Drills, Hand Work, Mills. For instance, a Bench Inspector will need more General Education than most other classifications, while his Health need not be so good. As soon as these selection requirements are decided, they should be added to the chart, under the proper classification in each case. The number of people needed in each classification, has already been shown in Step One.

The fifth step is to complete the chart, by filling in under each classification the details of the proposed course of study. From such a chart, together with a graph or schedule showing the rate of absorption of new help against the calendar, it is easy for the Director of War Emergency Training to plan his requirements of equipment and teaching staff, and to lay out his time tables. Such a chart also brings the War Emergency Training Scheme of a factory into a suitable condition for discussion and review with top management.

A War Emergency Trainee is a very desirable unit of help in a factory. This is largely because of his attitude of mind. Investigations reveal that how the employee feels about his job is the greatest single factor in his productiveness. The fact that the trainee has donated several weeks of his time to study for a new job, usually a much better job, makes of him a "career man". This applies even more with young women trainees, than with men. In order to foster the career-mindedness in our new young women trainees, we refer to them as "girl machinists" rather than machine operators, and we avoid the use of "female labor". For instance, we encourage our supervisors to refer to a girl as "Miss Jones" rather than as "Nancy". So, when War Emergency Trainees report for work, at their new jobs, they should be received as *career people*. If possible, the first day in the new factory should be spent in a special department so as to acquaint them with the organization and policies of the company, acquaint them with the privileges, rules and regulations, and discuss such vital matters as observance of the Official Secrets Act and Safety First precautions.

Another phase of War Emergency Training comes to the attention of the new trainee at this time. Through specialized educational departments in industries, War Emergency Trainees may continue to learn through systems of upgrading. These upgrading classes extend throughout the length and breadth of most of our large organizations. Machine Operators can learn Mathematics, Blueprint Reading and the principles of Machine Setting for the purpose of becoming Group Leaders. Group Leaders can take evening courses in Advanced Drafting, Management, and Organization, and qualify as Foremen, and so on. War Emergency Training of this type within industry, rates a specialized department, including a properly equipped and furnished classroom. Some industries have much broader training programs, on their own premises, and select and train men and women for semi-skilled jobs. In such cases the job of Liaison Officer, or Educational Director, is maintaining close co-operation between the industry's shops and the educational department.

The educational department makes available to the organization its facilities of accommodation for lectures, foremen's clubs, and other very beneficial activities. In many cases, a technical library is maintained there. The educational department also functions as a "home base" for apprentice schemes, and general upgrading schemes throughout the various departments and divisions of a large organization.

As a War Emergency measure, some companies have planned special short-term apprenticeships for toolroom help. By maintaining an educational department, it is possible for the industry to foster in the apprentices, a studious application of that related work which has an important bearing on their value, as general mechanical help. In a typical two and one-half year apprenticeship plan, the apprentices attend night school in the company's own educational department three hours per week average and are sent to school, with pay, for one-half day per week. In a co-operative scheme of this type, the apprentice has the opportunity of making the first one of each difficult type of job in the Technical School where time is not at so much of a premium and where the hazards of error are less.

Factory Struggle

This war is rapidly becoming, in fact has already become, quite largely a struggle between the factory personnel of one group of nations and the factory personnel of another group of nations. The Officers and Strategists are Management and Tool Engineers. That side which can turn out the most and best of mechanical weapons, and at the same time release large numbers of men to the fighting fronts to use them, will certainly prevail. News of a failure to produce, or of a stoppage of production is as good news to Mr. Hitler as the crossing of another river by his panzer divisions. Battles are won (or lost) in the factories before they are fought in the fields. The training ground for the armies of the factories is the War Emergency Training Plan.

22 Years' Experience

8 years—Shop experience, including apprenticeship and general foremanship.

22 years—selling machine tools and production tools

as

Sales engineer, District Manager and Sales Manager.

Available for representing quality lines of machinery, tools and equipment used in metal working plants of Western New York State (out of Buffalo). Very well known, well liked—proven ability and excellent sales-record.

Apply—THE TOOL ENGINEER—Box 721

2842 W. GRAND BLVD. DETROIT, MICHIGAN

Training Personnel:

The School's Task

Never have the schools been afforded so great an opportunity for cooperating with industry in so important a cause as now.

By ROY M. SHERK

Director, War Emergency Classes
Western Technical-Commercial School
Toronto

AT no previous time in our history has the school been presented such opportunities of co-operating with industry in the training of personnel.

Our problems in Canada are similar to those in the United States, and similar also are the methods of approach.

Many of you may have read Mr. Carl A. Gray's article "How Connecticut Solved the Training Problem" published in the April, 1941, issue of THE TOOL ENGINEER. It is well worth further study by anyone interested in the training of personnel. There has been a parallel development of this type of training in Ontario.

Training Agencies

The training agencies in this country may be classified for our purposes as follows:

1. *The Universities*

The engineering faculty of the University of Toronto has a greater registration this year than last.

2. *The Secondary Schools*

These are of the following types and may be combined: collegiates, technical and commercial schools. They are administered by the local board of education under provincial regulations.

3. *Special Schools* operating under the Dominion-Provincial Youth Training Program or under the Dominion - Provincial War Emergency Training Program.

4. Private and other special schools.

Technical School Training

Let us consider the training as provided in the technical school in the regular day classes. The student enters the school at about 14 years of age, after having completed eight grades in the public school.

During his first two years, if in the industrial course, he spends about one third of his time in shopwork and drafting and the balance in English and related work. In the first year, his shop time is divided among the various shops, machine, electrical, motor, sheet metal, brick, wood, and printing. In the second year, he may be permitted to "major" for example in machine shop, when he would spend his shop time in the machine shop and wood pattern only.

By now, the student may be 16 years of age and is no longer compelled by school law to attend. Family conditions may cause him to leave. He will have had at the most about 500 hours of machine shop.

Do not expect too much at first of the student who has spent two years in technical school. He has been in

Women Training for War Work
For some kinds of work, more adaptable than men.

Hanna High Pressure HYDRAULIC Cylinders

WHENEVER you are faced with the problem of securing smooth, dependable power movement in any direction, think of Hanna Hydraulic Cylinders. Built in 10 standard models, from 1½" to 8" bore, at working pressures up to 1500 lbs. per sq. in. Write for full details.

HANNA ENGINEERING WORKS
1765 Elston Avenue • Chicago, Illinois

for SMOOTH DEPENDABLE POWER at low cost

the machine shop less than the equivalent of 3 months working time.

Let me direct your attention to the machine graduate of the technical school. He has been at the school for a total of four years and is now about 17 or 18 years of age. During his last two years, he has spent half his time in machine shop, pattern shop, and drafting; the balance in shop mathematics, mechanics, English, etc.

In addition to the usual school projects designed to teach specific operations, he has helped his fellow students design and build a complete machine for the shops such as the power hacksaw shown in Figure 1.

The boys majoring in machine drafting sketched and detailed this machine in the drafting room. The students majoring in wood pattern made the patterns from the drawings. The machine shop majors built the machine. It is operating in our shop 24 hours a day.

We would like to see such boys get jobs as machine or tool room apprentices, pattern making apprentices, or juniors in the drafting room, as the case may be. They do obtain this type of work under wartime conditions. Our last graduating class left at Easter. No more will be available until next Easter, yet only three years ago many of these boys had to get jobs in bakeries or delivering handbills. No one had room for them anywhere in the organization.

Task of the School

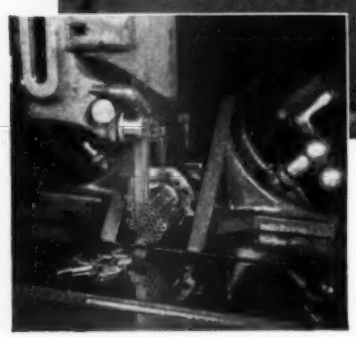
It is the task of the school to interest industry not only in the present war emergency training, but also in long-term training. I wonder how many times in the last ten years you yourself have spent a half-hour in the shops of your local vocational school.

At a dinner meeting of our local chapter this Spring, a fellow member smilingly suggested that we "were still making screw drivers" in our vocational schools. Well, we are, in the junior classes, but the means justify the end. You wouldn't start a first year student making the power hacksaw that we mentioned before.

Many vocational schools are doing this type of work, and this machine is not an isolated instance. We built a half dozen wood lathes and a half dozen bench drills of a type suitable for manual training. These had ball bearing spindles, and V-belt drive, and were designed by the students working only from catalogue illustrations, no similar machine being available at the time.

Before this, we built a combination disc, drum and spindle sander. The boy that designed the spindle drive for this sander is now assistant to the Vice-President of an internationally known firm manufacturing shell turning lathes. He has not been away from our school more than six years.

This type of work could hardly be called "spoon feeding," but presents a variety in construction. It requires team work on the part of the students, yet develops a sense of individual responsibility. Each student working on a different job, and a different job each year certainly helps to keep the teacher out of a rut. From a detailed study of a junior machine lathe which we had built, it was shown that the excess cost of this type of work over ordinary project work amounted to



Cutting-off nested small diameter tubing —50 pieces per cut. On production jobs like this, the extreme accuracy and comparatively fine teeth of the blade produce smooth-edge, semi-finished pieces at a very low cost.

Buy from your local distributor.

"It has increased production about 30%" at Independent Pneumatic Tool Co.

Used to cut off a great variety of stock; cold drawn tubing (2335 S.A.E., 3115 S.A.E., and 3135 S.A.E.), angle iron, and round, hex and square bars in a wide range of sizes, this MARVEL No. 8 Metal-cutting Band Saw "has increased production about 30% in the cutting-off department of the Independent Pneumatic Tool Co., Chicago.

The most versatile metal-cutting saw built, the MARVEL No. 8 is a truly universal tool. It handles work up to 18" x 18" cross section; cuts at any angle from 45° right to 45° left; does mitering, notching; saves warehouse delays and "cutting extras" and saves hours of machining by roughing work to size and shape.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N. Y.

Thanks a Million..

★ THIS year more people have come to us for more steel than ever before in our long history.

★ Such confidence is highly appreciated and we hope that we have proved worthy of it.

★ There have been many changes which affected us all, but our friends have demonstrated their cooperation in ways that stimulate our desire to be of greatest possible further service.

COLUMBIA TOOL STEEL COMPANY

Arthur T. Clarage, PRESIDENT

★ MAIN OFFICE AND WORKS, CHICAGO HEIGHTS, ILL.

War machines and munitions have to be good to stand up under war conditions. They must be made rapidly in huge quantities by a variety of plants. All parts must be strictly interchangeable.

Hence the task of guarding quality becomes a matter of life and death importance to a nation rearming to preserve its liberty.

Sheffield Visual Gages are stalwart guardians of dimensional quality. They are used in checking dimensions of manufactured and purchased parts, tools, production and master gages.

The sturdy Reed Mechanism, combined with the light beam lever arm, provides a sensitivity to meet the highest precision standards of measurement—but without the delicate fragility so often associated with sensitivity.

These gages are not delicate, they are strong and deadly accurate. They are made in various models to check accurately to thousandths, "tenths" or millionths of an inch and all provide rapid, easy gaging to any limits required on production work.

Write for information.

THE SHEFFIELD CORPORATION
Gage Division · DAYTON, OHIO, U.S.A.

SHEFFIELD MASTER GAGEMAKERS

less than 10% of the cost of a similar machine on the market. Yet many of our industrialists and engineers look upon a vocational school as still making "screw drivers." Surely a boy, other things being equal, who has had a hand in such machine construction should have a better chance of succeeding in your organization than a boy who has taken a traditional course dictated largely by university entrance requirements. Even the other subjects which the boy takes while at technical school such as mechanics and mathematics are related to his particular option.

Apprenticeship Training

Few manufacturing firms in this country have regularly conducted classes for training their apprentices in related work.

Many firms require their machine apprentices to attend evening school two evenings per week from October to March during the period of their apprenticeship, for drafting, mathematics and mechanics. The school will provide special progress reports at the firm's request.

Part-time classes may be organized so that the apprentice attends day school one-half day per week while on the firm's payroll.

Although the evening schools have diploma courses, in the past, few apprentices completed the required subjects. The apprentice will appreciate the recognition of receiving an apprenticeship diploma from the firm when he has served his time. This diploma may list the subjects that he has completed satisfactorily while attending evening school classes.

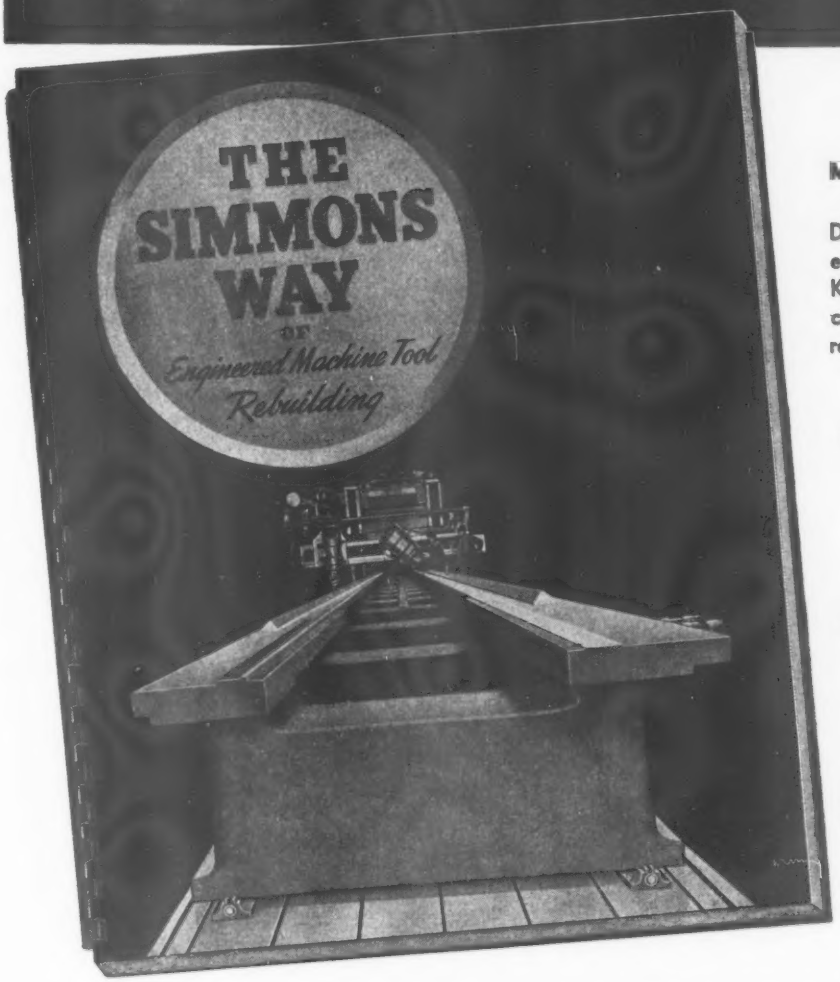
Any school Shop Director will welcome constructive criticism. The courses are flexible and are constantly being revised. Some people in industry apparently still believe that the schools think they are turning out machinists. Nothing could be further from the truth. All the school claims is that its graduates should be good material for apprenticeship, and the students are so impressed. The technical school is not a trade school.

May I make some suggestions regarding the selection and training of apprentices for your firm.

1. Adopt a definite apprenticeship program even if the number of apprentices required is small.

2. Set up a minimum standard for

THE BOOK IS OUT!



WHY
MACHINE TOOL REBUILDING IS IMPORTANT TO YOU.

DEFENSE PROGRAM requires every existing tool in working condition. Know how all types of machine tools can be rebuilt and adapted to current problems.

- It describes and illustrates modern rebuilding methods — Engineered Rebuilding — as perfected by Simmons. Unusual photographs show a 990,000-pound Gun Lathe, with 110" swing, in various rebuilding stages.
- It reveals how Simmons motorizes obsolete equipment and installs Power Rapid Traverse to lathes, boring mills, milling machines and planers . . . how beds or tables are lengthened, housings widened, rails and heads raised.
- It shows how Simmons designs and builds special-purpose and standard equipment as a result of its wide rebuilding experience.

This 58-page catalogue illustrates today's most efficient methods of machine tool rebuilding. For the first time, through words and photographs, you have the complete answer to "What is a rebuilt machine tool?" Here you find photographic case histories of vitally needed machine tools rebuilt, re-designed and modernized by Simmons.

You who know the importance of your machine tools today should be familiar with this means of increasing their productivity.

A request on your company letterhead will place it on your desk.

SEND FOR IT *To-day*

SIMMONS ENGINEERED *Machine Tool* REBUILDING

SIMMONS MACHINE TOOL CORP.
1810 NORTH BROADWAY, ALBANY, N. Y.

the selection of apprentices. Some firms insist upon graduation from technical school, others require three years. If a prospective apprentice has had only academic school training, suggest that he go first to the technical school for a year's special work. Set your standard as high as prevailing conditions permit.

3. Your apprentices may include those who have had little previous technical training. Consider giving the graduate of a technical school some credit then in the form of a shortened apprenticeship.

War Emergency Training

If the Dominion-Provincial War Emergency Training Program were operating in the States, I am sure it would be spoken of as the "DPWETP".

The program is a plan for training men and women for jobs in war industry and men for the various trade classifications in the armed forces. It is directed for the Dominion by the Minister of Labor, and for the Province by an inter-departmental committee representing the Departments of Labor and of Education. The program is administered in Ontario by the Regional Director.

The Dominion Government assumed 100% of the cost of this training except for administration expenses which were borne by the provinces and the cost of any additional machine equipment necessary which was met 50% by the Dominion and 50% by the province concerned. The training was given in the vocational shops of the regular technical schools which were made available by the local authorities without charge. The training was also given in special youth training centers. Approximately one hundred training centers are located in various cities across Canada. Twenty-eight of these are situated in Ontario.

Numbers in Training

The cumulative totals from the summer of 1940 to August 30, 1941, of students in training are as follows:

(a) In the Dominion
- Industrial Classes ...41,966
- R.C.A.F. Classes 6,415
- Army & Navy Classes 12,595
- TOTAL 60,976

(b) In the Province of Ontario
- Industrial Classes ...27,249
- R.C.A.F. Classes 1,544
- Army & Navy Classes 5,351
- TOTAL 34,144

It will be noted from the foregoing that 65% of the industrial training for the country has been given in this province and over half of all training.

The length of the training varies from two weeks to twelve weeks, depending on the character of the training required. All classes operate 40 to 44 hours per week unless of an upgrading nature in which case they may operate only four hours per week.

Admission to Classes

Training for industry is confined to British subjects over 16 years of age, male or female. Men in the age group 20 to 26 inclusive are not eligible for training unless they can prove they are physically unfit to serve in the armed forces. There are now very few classes for men that are not sponsored by some firm. There are no unsponsored classes for women.

★ There's a very good reason why OPM restrictions on high-tungsten tool steels needn't bother you a particle. It's DBL High Speed Steel—an exclusive low-tungsten development of our research which was perfected several years ago, especially with the strategic replacement of "18-4-1" in mind.

DBL is *one* tungsten "moly-type" High Speed Steel that slips into the place of 18-4-1 without a single hitch. You have nothing new to buy or to learn, because it heat-treats in the same equipment and by the same methods as 18-4-1. And you won't fall back a step in the production pace, because DBL performs as well or better than 18-4-1 in 85-90% of all cases, and frequently better!

Our Mill Service Staff is at your service in changing over to DBL or other A-L "moly-type" steels.

Mail the coupon below for the DBL "Blue Sheet," which contains complete technical data.

ALLEGHENY LUDLUM
STEEL CORPORATION — PITTSBURGH, PA.
Tool Steel Division — *Watervliet, N.Y.*

Allegheny Ludlum Steel Corp. T-171
Oliver Building, Pittsburgh, Pa.
Send me a copy of "DBL Blue Sheet."
Name.....
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PARTIAL LIST OF FIRMS USING TURNER UNI-DRIVE

American Brake Shoe & F. Co.
Kellogg Division
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Electric Auto-Lite Co.

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Kohler Corp.
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The New York Air Brake Co.

Ohio Pattern and Foundry Co.
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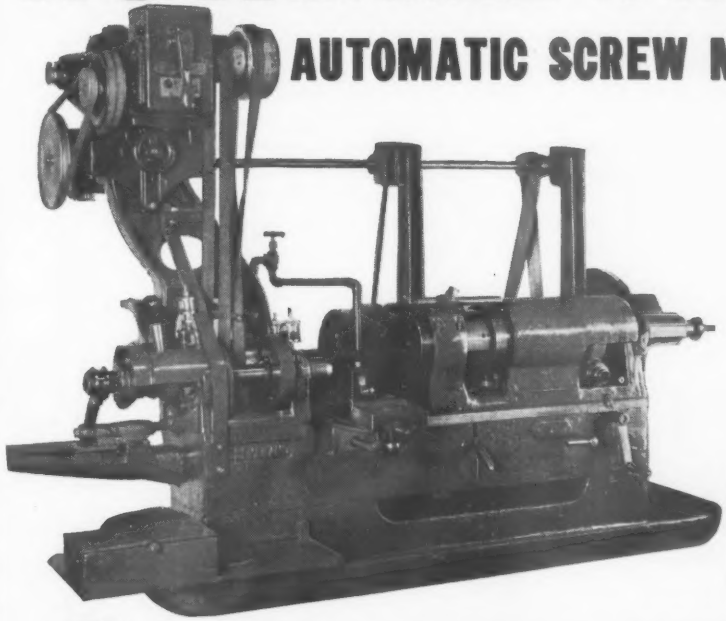
NOW APPLICABLE TO CLEVELAND AUTOMATIC SCREW MACHINES



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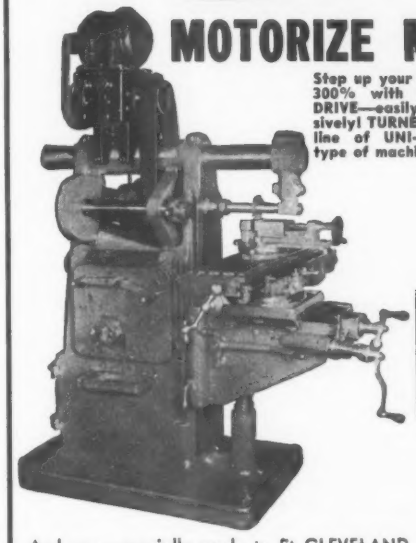
MOTORIZE MACHINE TOOLS QUICKLY

Step up your production 35% to 300% with the TURNER UNI-DRIVE—easily, quickly, inexpensively! TURNER offers a complete line of UNI-DRIVES for every type of machine tool!



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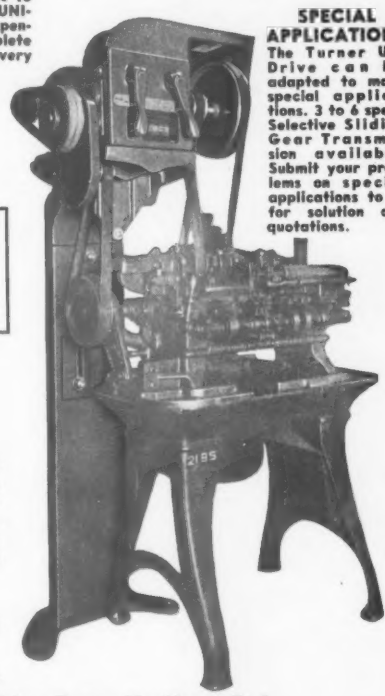
SPECIAL APPLICATIONS
The Turner Uni-Drive can be adapted to many special applications. 3 to 6 speed Selective Sliding Gear Transmission available. Submit your problems on special applications to us for solution and quotations.



And now—specially made to fit CLEVELAND AUTOMATIC SCREW MACHINES, Turner Uni-Drives offer an ever widening opportunity for manufacturers to meet increased Defense production schedules. Turner Uni-Drives eliminate overhead belts, pulleys and ceiling vibration—save workman's time—cut down maintenance cost—and materially help increase output and profits.

EASY TO INSTALL—can be in operation in 2 to 4 hours.

GUARANTEED—for one full year. Subject to return within 60 days if not satisfactory.

See your dealer or write for information and prices.

THE TURNER UNI-DRIVE COMPANY *(Sales Division: Turner Machinery Co.)*
1638 CENTRAL STREET Kansas City, Mo.

THE TURNER UNI-DRIVE
WITH FOUR-SPEED SELECTIVE SLIDING GEAR TRANSMISSION

When there is a surplus of suitable applicants, the order of preference is as follows: (a) Veterans of the Great War and those discharged from the armed forces in the present war. (b) Men forty years of age and over. (c) Men under forty years of age.

Subsistence allowances are paid as follows: (a) Single trainees living at home and who can prove there is financial need—up to $3.00 per week. (b) Independent single trainees who are living away from home—up to $7.00 per week. (c) Trainees who are heads of families—up to $12.00 per week.

Travelling expenses of trainees to the training centers and return to their homes or to certified employment may be paid when necessary.

Each trainee who satisfactorily completes a War Emergency course is given a certificate by the head of the School, setting forth the length of the course, and the grading obtained in the different types work involved.

Placement

The labor requirements of firms awarded war contracts were ascertained through the employment service offices, through special placement officers, or through the staffs of the schools. These agencies were asked to maintain close contact between industry and the schools so that the training given would meet the requirements of the employers. Particular attention was paid to the matter of obtaining sponsorship of trainees by industry. In such cases, industry referred groups of students to the local schools, asking that they be trained along certain definite lines and promising to take into their employ all those who satisfactorily completed their training. These industries maintained close contact with the schools throughout the operation of the classes.

Roy M. Sherk
Success requires personal contact.

Before dismissing War Emergency Training from the Dominion-Provincial angle, I should like to point out that in my opinion the particular training given has been well and economically administered. The cost of instructors per trainee day in a well operated school varies from 50c to 60c, with the Dominion average slightly higher. The total cost, less equipment and subsistence allowances per trainee day ranges from 65c to 80c for the usual school, although higher in the case of special centers which have recently been set-up and require an initial outlay for hand tools, materials, supplies, etc.

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

Production
Adaptability
★ Fixture Saving
Operation Saving
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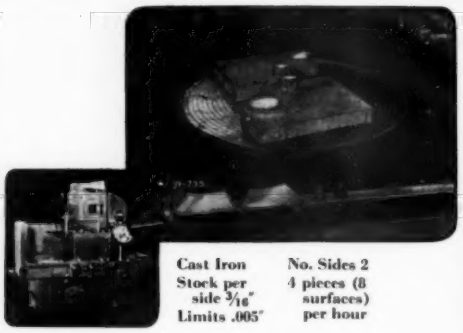
Fine Finish
★ Flatness
Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*

"PUT IT ON THE BLANCHARD"



Cast Iron Stock per side 3/16" Limits .005"
No. Sides 2 4 pieces (8 surfaces) per hour

For Accurate Parallel Surfaces on Projecting Bosses

THESE valve block plates have two projecting bosses. The surfaces of the outer bosses are .500" + .001" lower than the surfaces of the bosses at the center. The outside surfaces are ground first, then the wheel is raised, the chuck is moved in, and the higher surfaces are ground. The plates are then turned over and ground, resting the longer boss on the chuck, the shorter boss on a ½" size block, and the unsupported corner on a small screw jack.

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64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

Reconditioning Tools for NATIONAL DEFENSE

Tools of all descriptions are the government's first line of defense.

High Speed Tools, drills, end mills, files, pneumatic tools and Hard Chrome are all vital to the manufacture of defense equipment of many different kinds.

Due to the National Defense Armament Program, thousands upon thousands of new orders for tools to be reconditioned are being shipped to our three different companies daily. Consequently it has been necessary for us to step up our production facilities four fold, and still the demand continues to increase.

Although our production facilities have been increased to the utmost . . . it has been almost impossible to give normal service under current conditions, and to fill all of the needs of all of our customers.

We wish to assure every customer that everything possible is being done to maintain a standard of service and to make deliveries when promised.

As the accumulation of orders is cleared, service will improve progressively, and the needs of our customers will be filled more promptly.

Our policy

The capacities of our THREE COMPANIES have been allotted to established companies proportionately in relation to the volume normally required by each. To the extent that it is humanly possible for us to distribute our service equitably among all customers, that will be done.

May we have your cooperation

Eastern Plant
EASTERN CUTTER SALVAGE CORPORATION
30-32 Littleton Avenue, Newark, New Jersey

Western Plant
MASTER TOOL COMPANY, INC.
5605 Herman Ave., NW, Cleveland, Ohio

Chrome Plant
MASTER CHROME SERVICE, INC.
5709 Herman Ave., NW, Cleveland, Ohio

Set-Up

The director of the War Emergency Classes in the individual school is directly responsible for: (a) Contact with industry. (b) Advertising for and selection of applicants. (c) Determining the rate of subsistence that shall be paid and paying the allowance. (d) The content of the course of study and teaching methods. (e) Timetables, so as not to interfere with the regular day and evening school classes. (f) Hiring the staff. (g) Purchase of supplies and equipment. (h) Separating the War Emergency costs from the regular Board of Education costs. (i) Grading the trainees and giving them certificates upon completion of the course. (j) Placement of students. (k) Provision of such reports as may be required.

Our shops are available 24 hours a day except while engaged in long term training, that is the regular day and evening classes. They are busy now with War Emergency Training and our National Emergency demands that they be kept busy. This can only be done by effective co-operation between Industry and the School.

A special representative of the Training Program called on the Superintendent of a large steel manufacturing firm in this city. They discussed opening a blue print reading class for the employees of the firm at the school. The Director was called to the phone. The time was fixed at Tues. and Thurs. evenings, 7:30 to 9:30 and arrangements were made for the school instructor to visit the plant before the class started.

The class arrived. The shop superintendent came with them and he brought the plant engineer. These executives did not leave the school that evening until 11:00 o'clock. They spent the evening seeing the class started, inspecting the school shops, and in a discussion of what the school could do for them in solving their particular apprenticeship problem. The school appreciates such co-operation.

The school is well adapted for teaching elementary blue print reading although the more advanced work pertaining to the firms special problems might well be given by a suitable man, if available, from the firm, either at the school or at the plant.

Another example deals with the world's largest machine gun manufacturing plant. The initial contact had been made with the Personnel Manager and the Director of Education of the firm, a member of the A.S.T.E.

The first order was for a 12-week course for 200 male machine operators. Certain executives expressed doubt as to whether suitable men were available and willing to take the length of training indicated. The school found the men, although some were supplied by the firm.

The school advertised without mentioning the firm's name. The applicant filled out an application form and then tried a 20 minute test which merely served as a "Go — No-Go" gauge. The applicant was interviewed and if it was believed that he answered the firm's specifications, he was given an interview form to take to the Personnel Manager of the firm. If the Personnel Manager was willing to admit him to the class, the manager signed the form.

Interviewing these men makes de-

Every MACHINE SHOP EXECUTIVE Needs this New KENNAMETAL Catalog to Cut Steel Profitably . . .

Specifications and prices for thirty-five styles of standard tools in many shank sizes and 177 standard blanks are listed in the new KENNAMETAL Catalog No. 42. In addition, typical applications for each style of tool are clearly illustrated by line drawings, photographs and information on specific examples of the use of KENNAMETAL have been included. The new KENNAMETAL round shank boring tools, cut-off tools, roller type turning tools, and solid round tools are illustrated and described.

KENNAMETAL Catalog No. 42 is the most complete carbide tool catalog and manual ever published Send for your copy today.

Standard and Modified Standard KENNAMETAL tools are shipped within 10 days of receipt of order; Standard blanks within 3 to 4 days. Order Standard tools and blanks and save time!

Contains Valuable Engineering Data for Users of Steel Cutting Carbide Tools:

- Materials machined with KENNAMETAL and grade selection.
- Selection and design of tools.
- Grinding of tools.
- Chip breaker designs.
- How to avoid grinding cracks.
- Brazing blanks to tool shanks.
- Typical turret lathe set-up using standard tools.

Gentlemen:
Please send me your new KENNAMETAL Catalog No. 42.

Name.....

Title.....

Company.....

Street.....

City.....State.....

McKENNA METALS Co
600 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

Attention---PLANT LAYOUT MEN!

With the present tremendous plant expansion programs under way, the item of machine space becomes ever more important. Plant and Tool Engineers are burning "the midnight oil" trying to work the required amount of machine tools into a given amount of floor space.

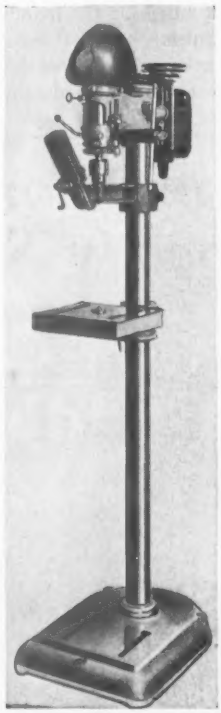
This is where the Dalzen line of Vertical Thread Grinders plays an important role—accuracy and production combined in a machine tool requiring little more than half the space formerly required for the production of ground theads.

These machines are furnished in two sizes. No. 1 Dalzen which will grind up to 6 inches diameter, 10-inch length threads anywhere on an 18-inch shaft. Dalzen No. 2 will grind a 3-inch diameter, 4 inches in length anywhere on an 8-inch shaft.

We also manufacture the Dalzen Combination Center Lapping Machine and Drill Press which saves the floor space formerly required for two separate machines.

This machine is 38 inches deep, 48 inches wide, and 75 inches high. Extreme operating floor space is 38 inches by 60 inches. Approximate shipping weight, 4400 lbs.

Machine is 39 inches deep, 43 inches wide, and 72 inches high, with extreme operating floor space 39 inches by 48 inches. Shipping weight is approximately 3200 lbs.



Can be changed over in a moment from Center Grinder to Drill Press or vice versa. You simply loosen one bolt and adjust the Center Grinder dresser in or out of position.

Write For Descriptive Literature

DALZEN TOOL & MFG. CO.

12255 E. 8 Mile Road **Detroit, Mich.**

mands on the employment manager's time, but he can interview them at his own convenience. He reaps his reward when he can call the school at 9:30 at night and ask the School to have 27 men down to the plant ready to start work the next morning.

One of the divisional superintendents of the plant had been frankly not too optimistic at the inauguration of the training scheme. It was with some satisfaction to the school that the next class was arranged at the superintendent's special request. Any success which we may have had can be attributed to such men taking the time to tell us what they wanted.

This new class was limited to six weeks training and the men were admitted by the school directly to the class. Only the doubtful cases were referred to the Personnel Manager for checking.

Courses of Study

Courses of study are a matter of individual arrangement with the plant concerned. At the present time, this firm is considering using some women for bench work. Previous attempts had not been too satisfactory and classes were organized to give this type of training.

Arrangements were made with the Director of Education of the firm for our key instructors to meet the particular supervisors looking after that part of the work and special projects, gages, and instruction sheets were designed to assist in teaching the skills required.

The school is under no misapprehension that it can do all the training. The school can teach the basic fundamentals for which it is equipped or for which it may be readily equipped. Beyond this, the training must be given in the plant.

Available Supply

At the present time, the available supply of training material is undoubtedly diminishing, but some are becoming available who are shifting their occupations at least temporarily. The labor problem is more serious in this country now than that during the first Great War. Previous to the last war, immigration was heavy, when 1,108,000 persons entered this country in the three years, 1911 to 1913. In 1936 to 1938 only 44,000 immigrants arrived. To fulfill the labor demands will require a major shift of employment from peace-time to wartime industry.

Further progress in training methods at the present time might be made by each individual firm conducting an internal survey of the type and numbers of the various kinds of personnel required, and the determination of approximate dates when such would have to be available. Any advance information which can be supplied to the schools would facilitate the schools organization and the type of training given.

The success of any such training scheme is dependent to a great degree on personal contact between the Directors and instructors on the one hand, and the Personnel Manager, Director of Education, Plant Superintendent, and supervisors on the other.

For Prompter Deliveries Specify Standard Reamers

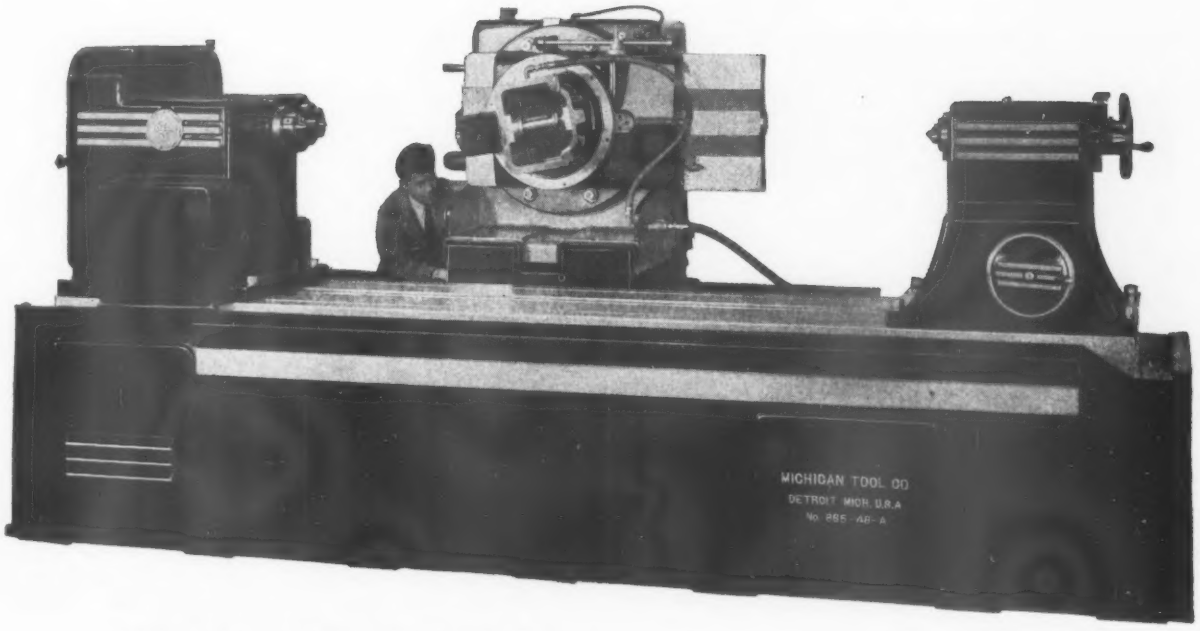
BEFORE you specify special reamers for that defense job you have to tool in a hurry, investigate standard McCrosky-SUPER Adjustable Reamers. They are made in a variety of styles and a wide range of sizes. They are being produced continuously, and the size you need is on its way to completion before you order . . . McCrosky Reamer Bulletin 15-A will help you decide. Ask for a copy.

McCROSKY TOOL CORPORATION
MEADVILLE PENNSYLVANIA
FINE CUTTING TOOLS
SUPER ADJUSTABLE REAMERS — ADJUSTABLE BLOCK BORING BARS
JACK-LOCK MILLING CUTTERS — SPECIAL PURPOSE TOOLS
WIZARD QUICK-CHANGE CHUCKS — McCROSKY TURRET TOOL POSTS

Announcing

A LINE of "FINISHERS"

FOR LARGER GEARS



Largest of the new Michigan line, the model illustrated will handle gears up to four feet diameter.

MAKING AVAILABLE the crossed axis principle of gear finishing for all sizes of gears up to 4 ft. diameter, this new line of "Michigans" is designed to provide quietness, accuracy and life for large gears comparable to those now achieved in smaller gears by use of the "shaving" process.

Today, in the smaller sizes of gears — up to 18 inches — more gears are finished on Michigans than on all other types combined. "Tomorrow," probably the majority of large gears will be shaved.

And in such gears . . . for speed reducers for ships and power plants . . . for machine tools and all kinds of heavy machinery . . . for ordnance, etc. . . . the use of this process will probably make possible a reduction in size by virtue of the higher load capacity obtained through greater accuracy.

The new line comprises three machines, as shown below. All machines are designed for heavy duty, and will take gears up to 20 inch face width.

The machine illustrated is an 865-48—the largest gear finisher ever built. It is already in operation turning out gears in a defense production plant.

Model	For Gear Diameters		Distance between Centers (in.)
	Max. (in.)	Min. (in.)	
862-24	24	1	36*
862-36	36	2	48*
865-48	48	4	97
** May be increased on special order.*			

MICHIGAN TOOL COMPANY

7171 E. McNichols Road **Detroit, U. S. A.**

NEW LITERATURE . . . . . .

Of Interest to the Tool Engineer

Calculator

Ohm's Law Calculator. 10c. Ohmite Manufacturing Company Dept. TE. 4835 Flournoy Street, Chicago. This convenient Ohm's Law Calculator gives the answer to any Ohm's Law problem with one setting of the slide. No decimal points to worry about. Requires no slide rule knowledge. All values are direct reading. Simple instructions appear on the Calculator.

(305) Metal Cutting

Racine Shear Cut Production Saw. 8 pp. Racine Tool and Machine Company, 1777 State Street, Racine, Wisconsin. This folder illustrates and gives details of construction of the Racine high speed metal cutting saw. Included is a chart which gives the cutting time in minutes for round stock for varying strokes per minute and rate of feed.

(306) Carbide Tools

How to Make, Use and Maintain Firthite Sintered Carbide Cutting Tools. 64 pp. Firth-Sterling Steel Company, McKeesport, Pennsylvania. This handbook contains sections on Firthite, telling of its properties and uses and methods of making grade selections, general purpose tools, with suggestions on uses, styles and grades, how to make Firthite tools, giving detailed instruction, how to use and maintain the tools, and a section on general reference data including cutting speeds and feeds.

(307) Riveting

Air Powered Rivitor. 4 pp. The Tomkins-Johnson Company, 624 North Mechanic Street, Jackson, Michigan. This folder describes and gives the specifications for this Tomkins-Johnson automatic feed air powered rivitor which handles flush riveting.

(308) Finishing

Finishing Suggestions. 6 pp. Sundstrand Machine Tool Co., 2532 11th Street, Rockford, Illinois. This bulletin contains illustrations of the use of the new Sundstrand Hi-Speed Sander with suggestions as to abrasives and methods found most suitable for various operations on both metal and wood finishings.

(309) Machine Tools

Sundstrand General Catalog. 16 pp. Sundstrand Machine Tool Company, 2532 11th Street, Rockford, Illinois. This new general catalog contains descriptive information and principal specifications of our machine tools and auxiliary equipment including lathes, rigidmil, electromil, special machines, centering machines.

(310) Shears

Power Squaring Shears. 20 pp. Niagara Machine & Tool Works, Buffalo, New York. This bulletin describes, illustrates, gives the principal specifications of the Niagara line of power squaring shears.

(311) Castings

Ampco Metal Centrifugal Castings. 6 pp. Ampco Metal, Inc., Dept. TE, Milwaukee, Wisconsin. Description of the centrifugal casting process, illustrations

KNIGHT TIME IS PRODUCTION TIME

In these days of "full speed ahead," set-up time turned into production time is like money in the bank.

The ease and speed with which work can be set up on a Knight Miller increase its production time to a maximum.

Dial indicators save preliminary layout time and eliminate jigs and fixtures. *Counter-balanced* spindle head and *Centralized controls* make for ease of operation.

KNIGHT TIME IS THE QUICKEST TIME

Write for NEW Catalog

W. B. Knight Machinery Co.

ST. LOUIS, MISSOURI

STANDARD *Cemented-Carbide* TOOLS

IN YOUR HANDS

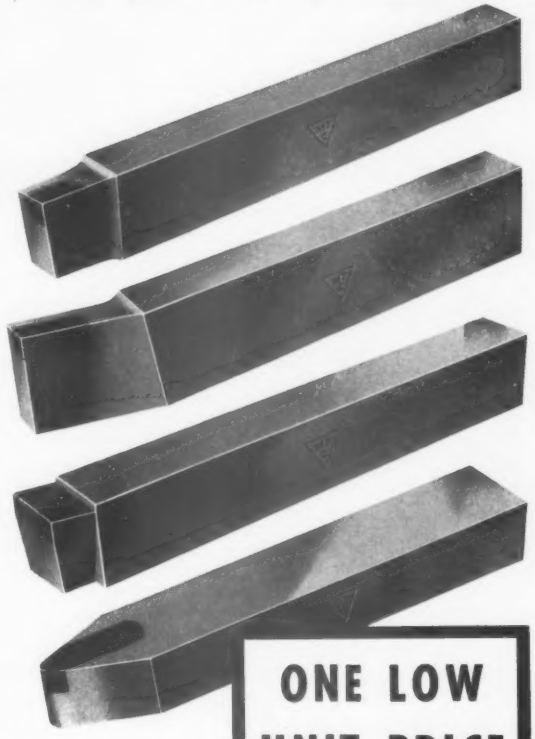
Within 24 TO 48 HOURS

HERE ARE standard cemented-carbide tools that will meet your requirements for almost all turning, boring and facing jobs. ADEQUATE STOCKS NOW MAKE POSSIBLE IMMEDIATE DELIVERIES.

For several years, the Morse Tool Company has been producing thousands of these tools for a limited number of customers. Now the departments devoted to cemented-carbide work are installed in a separate plant . . . with the most modern equipment . . . and with a large crew of thoroughly experienced men. The expanded production facilities have made it possible to build up the complete range of types and sizes which can now be supplied from stock.

The present prompt deliveries cannot be guaranteed indefinitely. To avoid disappointment, we suggest immediate action on your part. Write for complete information and prices.

We are authorized suppliers of Carboloy, Firthite and Vascoloy-Ramet cemented carbides.



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Carbide Fabricators DIVISION OF

MORSE TOOL CO.

116 E. GOLDENGATE AVE.
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of parts produced by this method, as well as equipment used, and a chart giving centrifugal test in size range are included in this folder.

(312) Carbide Tools

Tantalum - Tungsten Carbide Tools and Blanks. 28 pp. Vascoloy-Ramet Corporation, North Chicago, Illinois. This new general catalog lists 22 typical styles of Vascoloy-Ramet single point tools, together with a grade selected chart giving recommended uses of the various grades. Included are instructions for ordering tools and blanks, also tables for computing cost of standard and special blanks.

(313) Welding

Vest Pocket Checking Pad for Cutting Costs, Speeding Work, Improving Quality, Increasing Profits by Arc Welding. 40 pp. Hobart Brothers, Company, Box TE 111, Troy, Ohio. This booklet pictorially and editorially questions reader about 23 typical arc welding applications for possible use and benefit by manufacturers.

HOW TO ORDER

Booklets listed in this department and identified by a key number preceding the heading may be obtained by using the postcard on page 99. No postage is required.

(314) Carbide Tools

Kennametal Steel and Metal Cutting Tools and Blanks. 36 pp. McKenna Metals Co., 600 Lloyd Avenue, Latrobe, Pennsylvania. This new general catalog covers specifications and prices of standard Kennametal steel-cutting carbide tools and blanks, giving typical application to each style of tool. Illustrated by line drawings, photographs, and information on specific examples.

(315) Rotary Tools

Midget Milling Cutters. 8 pp. Severance Tool Company, 1522 E. Genesee Avenue, Saginaw, Michigan. This folder illustrates and describes the various styles of Severance rotary power tools.

(316) Grinding

What, Why and How. 32 pp. Norton Company, Worcester, Mass. This book is intended primarily for apprentices, trade and technical school students and many new operators of grinding machines. The information is fundamental, and is said to be applicable to any kind of precision grinding. Copies will be sent free of charge to trade schools, technical schools or any industrial apprentice training school.

(317) Hydraulics

Vickers Flow Control and Overload Relief Valves. 4 pp. Vickers, Inc., Detroit. Illustrations, description, blue prints, and performance data are included in this folder.

(318) Polishing

Brightboy Catalog. Brightboy Industrial Division, Weldon Roberts Rubber Company, Newark, New Jersey. The wide application and use of Weldon Roberts Brightboy soft rubber light abrasives for polishing many types of metals are described in this new price list and illustrated leaflet.

(319) Blueprinting

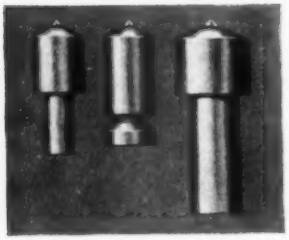
Pease Catalog M 41. 158 pp. The C. F. Pease Co., Chicago.

This exceptionally attractive and complete catalog contains sections on arc lamp blueprint machines, high pressure quartz tube blueprinting machine, low pressure mercury tube blueprinting machine, sheet washers, sheet dryers, blue printing accessories, sensitized paper, modern drafting furniture and photographic arc lamps.

TODAY'S PROBLEM: Production!

TOMORROW'S PROBLEM: Competition!

Solve BOTH with ASCO DIAMOND TOOLS



Landis Nib, Norton Nib, Cincinnati Nib for truing and shaping emery wheels

Manufacturers who now use "Asco" Diamond Tools to increase defense production, will be in a favorable position to meet keen post-war competition. The unequalled hardness, durability and cutting qualities of diamonds, so vital to today's need for faster production, will provide the savings that will keep many a manufacturer "out of the red" when business goes back on a peace-time basis.

"Asco" Diamond Tools are unsurpassed for turning, boring, milling and truing on toughest metals, alloys and abrasive materials. They permit precision cutting at higher speeds, maintaining close tolerances for much longer periods. They impart a finish so smooth that further grinding and polishing are often unnecessary. The name "Asco" is your assurance of dependable quality, backed by Anton Smit & Co., Inc., for over thirty years specialists in industrial diamonds for every need. Send blueprints for quotations on special shaped tools. Write for illustrated folder and prices.

Shaped Diamond Cutting Tools for turning, boring, facing

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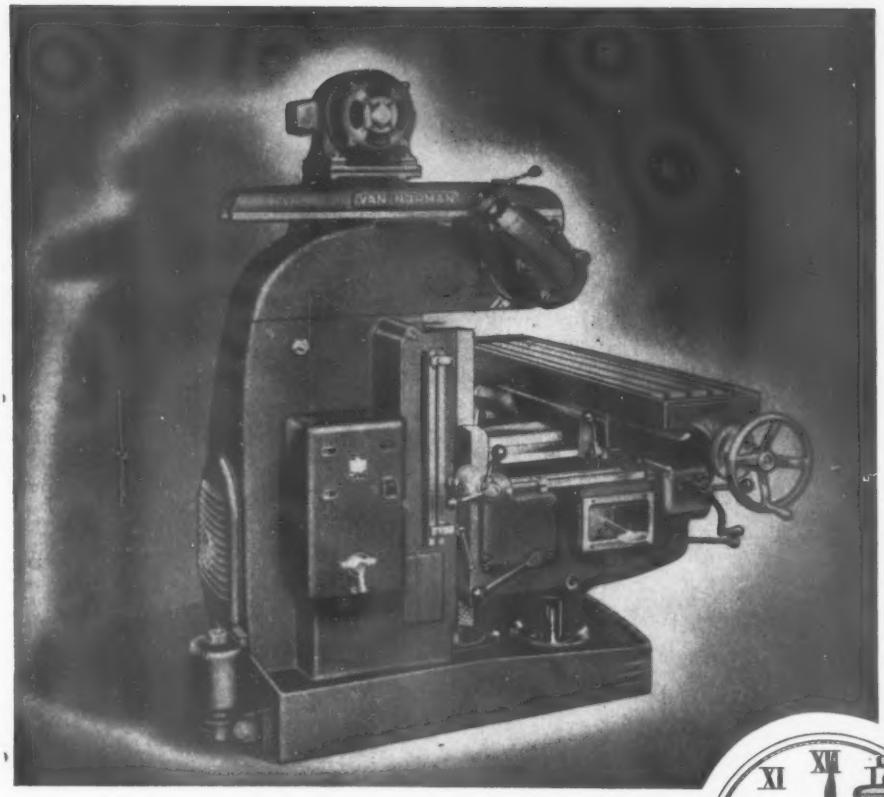
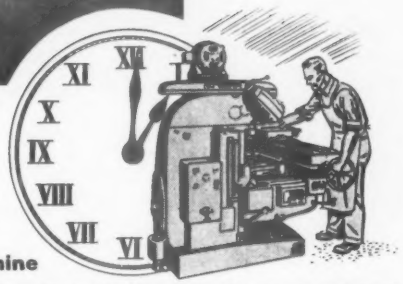
MANUFACTURERS OF ALL KINDS OF DIAMOND TOOLS.





MORE WORK PER MAN-HOUR . . .

As one authority puts it: "You don't buy a machine tool so much as you buy results — the greatest number of pieces per hour, produced with highest accuracy." And this is exactly what you get in every one of the five models of Van Norman Ram Type Millers. Your operators can turn out more and better work because they have so much less preliminary, error-charged, fussing to do . . . because it is so much easier to set up these machines . . . and to control them when they are in operation. Set-up time is saved by combining the adjustments of cutterhead and ram to take successive cuts from horizontal to vertical.

Control is simplified by grouping the levers, governing direction of power feeds and of 6-way rapid traverse, right at operator's fingertips on both sides of the machine . . . and by giving him large dials for easy, accurate reading. And accuracy is underwritten by Van Norman's 50-year tradition of high-precision manufacturing . . . by full measure of quality in every mechanical feature, including ample weight and rigidity for smooth operation on heavy cuts. That's why . . . when you buy a Van Norman Universal . . . you buy results.

No. 26 & No. 36
RAM TYPE UNIVERSAL
Table: 50" x 12"
Range: 28" longitudinal, 12" cross, 18" vertical
(No. 36 Table: 58" x 13")

Van Norman Machine Tool Co., Springfield, Mass.

(320) Surface Plates

Precision Surface Plates, Angles, Cubes—and wheels, handles and knobs. 4 pp. Machine Products Corporation. 6769 McNichols Road, Detroit. This folder shows photographs of all the items mentioned in the title along with mechanical drawings, sizes and prices.

(321) Steel Specifications

SAE and AISI Specifications Comparison as applied to Carbon and Alloy Steel Bars. 24 pp. Joseph T. Ryerson & Son, Inc., Chicago. This booklet contains all the official data for both of these new systems of identification. Direct comparisons of the equivalent or alternative steels are given in quick tabular form. Complete analyses ranges for straight carbon and alloy steels of both systems are listed.

(322) Hydraulics

Engineering Tables. 12 pp. Watson-Stillman Company, Roselle, New Jersey. These Tables include capacities of hydraulic rams, discharge of water for circular straight edge orifices, medium carbon seamless steel pipe data, decimal equivalents, circumferences and areas of circles, metric conversion tables, strengths of materials, and useful hydraulic formulae.

(323) Drills

Hard Steel Drills. 12 pp. Black Drill Co., Cleveland, Ohio. This folder describes the new hard steel drills which are said to drill hardened steel without annealing any portion of the piece. Operations are illustrated, and a table of sizes available is included.

(324) Micrometers

Davis Tubular Micrometers and Standards. 4 pp. Davis and Thompson Company, Milwaukee, Wisconsin. This bulletin contains information and data on these large size micrometers. Bow micrometers range from 0 to 96 inches, bar micrometers from 6 to 168 inches.

(325) Nylon Brushes

Industrial Brush Bristles Made of Du Pont Nylon. 16 pp. E. I. du Pont de Nemours & Co., Wilmington, Delaware. This booklet gives a short history of nylon, outlines its uses, lists its general physical and chemical properties, and includes a sample of Nylon bristles.

(326) Abrasive Blasting

The Airless Wheelabrator. 16 pp. American Foundry Equipment Company, Mishawaka, Indiana. This booklet concisely answers questions about the Wheelabrator—the simple mechanical unit that utilizes controlled centrifugal force, instead of compressed air, for abrasive blasting.

(327) Shears

Auxiliary Attachments for Quickwork Whiting Rotary Shears. 8 pp. Quickwork-Whiting Division, Whiting Corporation, Harvey, Illinois. Illustrations, descriptions, and specifications of their various attachments are given.

(328) Welding

Resistance Welding Electrodes and Alloys. 24 pp. P. R. Mallory and Company, Inc., Indianapolis, Indiana. This general catalog gives detailed information on welding electrodes and alloys.

BEE-LINE HYDRAULIC PRESS (F79)

A new 125 ton Hydraulic Press is announced by the Bee-Line Company, Davenport, Iowa. This hydraulic unit is mounted on a movable roller bearing carriage, which permits the applying of pressure at any point in a 84″ x 34″ area bed. The jack carriage can be raised or lowered 16″ with a minimum space between the ram and bed 2″, and a maximum space of 28″. The ram travel is 10″.

Thanks for Your Patience!

OUR plant, in common with thousands of other American industrial units, is working at its peak on Defense Production. We are cooperating with the government to the limit—as you would want us to do.

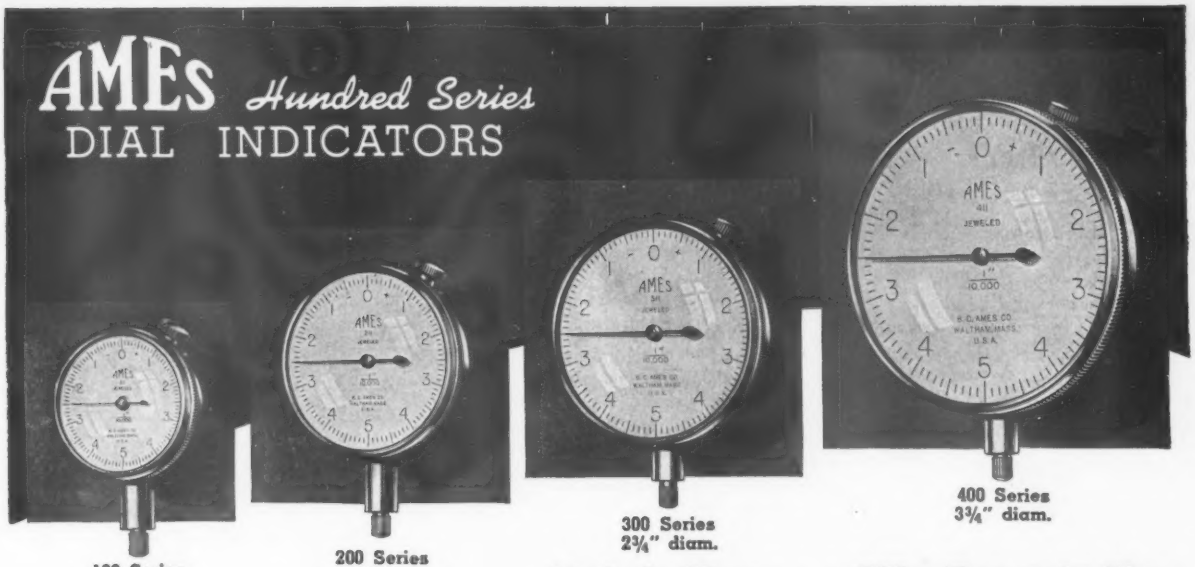
At the same time we are keenly aware of the civilian needs of our customers. We know only too well how much you need Davis Boring Tools. And we want you to feel that we are doing everything humanly possible to get them for you.

Increased floor space—new equipment—more skilled men in every department—all are being taxed to the utmost to produce Davis quality Tools in ever-increasing quantities. We are thinking of you, and doing our level-best to SERVE you. Thanks for your continued spirit of patience and understanding.

DAVIS BORING TOOL DIVISION
LARKIN-PACKER CO., INC., ST. LOUIS, U. S. A.

DAVIS BORING TOOLS

AMEs *Hundred Series* DIAL INDICATORS



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A complete line of modern indicators of the latest design and with exclusive features, developed from experience gained during a half century of manufacturing only the finest instruments of their kind. Superior to all others in quality, accuracy and durability, yet they cost no more. Investigate and compare them.

Catalog No. 52 on request.

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Timken Bearings for the Main Spindle—
All Others Anti-friction

Built in two sizes
8" stroke
12" stroke

Accurate — simple for toolroom manufacturing. Self-contained motor drive.

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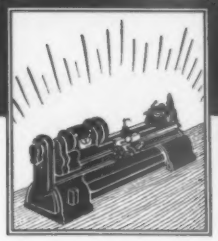
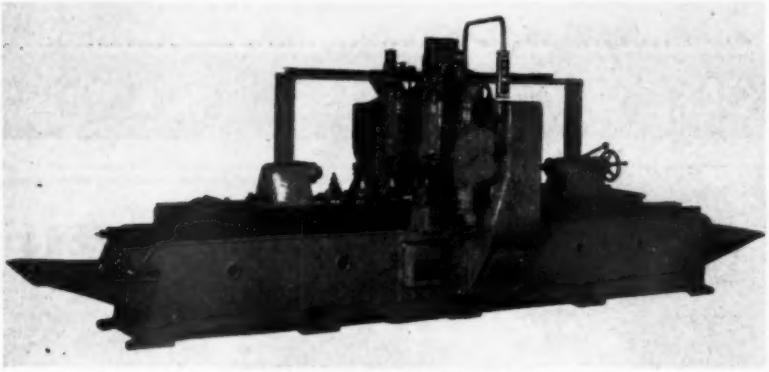


SUNDSTRAND PROPELLER EDGE MILL (F80)

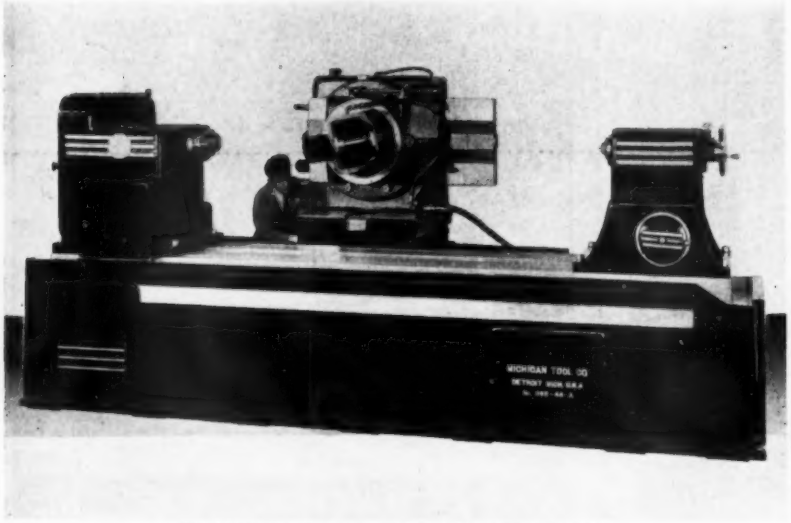
The Sundstrand Machine Tool Company, 2532 11th Street, Rockford, Illinois, has recently completed a new machine for milling the edges of propeller blades. Built around the fluid-screw rigidmil, the machine has a number of interesting special features for this particular operation.

In order to mill both sides of the blade simultaneously, the machine is provided with two vertical type spindle heads mounted on a cross rail. Movement of each head along the cross rail is controlled by a screw driven by a fluid motor which, in turn, is controlled by a hydraulic duplicator attachment. Attached to the machine table is a two-sided cam on which the duplicator fingers ride. As the table feeds longitudinally, the cam, through the duplicator attachments, controls cross movement of the head to transfer the desired shape to the contour of the part. The heads are both driven from one gear box and have pick-off gears for simultaneously changing the speed of both spindles.

The part is held on the machine table between a headstock and footstock member and is supported at intermittent points by jacks. Using spiral milling cutters, spindles are arranged to rotate so that the cutting thrust is down against the jacks. After the part is loaded in the fixture the operator presses the buttons on the electrical control pendant which start the spindle hydraulic and coolant motors. Operation of the machine is automatic, with cross movement controlled by the duplicator attachment. As a safety feature the cycle is so arranged that the machine table cannot rapid traverse return when the heads are in the cutting position.



Sundstrand Propeller Edge Mill
Mills both sides of the blade simultaneously.



Michigan Tool's Largest Gear Shaving Machine
The control is entirely electrical.

MICHIGAN TOOL GEAR FINISHERS (F81)

A new line of Gear Finishing Machines making available the crossed-axis principle of gear shaving for large gears is announced by the Michigan Tool Company, Detroit. The new line of machines includes three sizes, the largest capable of finishing gears up to 4 ft. in diameter and 20 inches face width. This machine (See Cut) is the largest ever built for gear shaving and already in operation in actual gear production in a plant engaged in defense work.

The largest machine utilizes the principle of rotating the work in engagement with the shaving cutter. The cutter follows across the face of the gear at predetermined speed. Two optional methods of finishing the gear are available; in the first, the cutter slide may reciprocally translate parallel to the work axis. At each end of translation the cutter is fed toward the work until a limit is reached. Then the cutter travels a predetermined number of translations before automatically terminating the cycle. With the internal attachment, this method is also used, except the feed is reversed. In the second method, the cutter slide is set in a vertical position, in which case a complete cycle consists of one translation of the cutter and return at right angle to the work axis. For this method a number of feed and finishing translations can be secured in the same manner as with the first method.

Control of the largest machine through its operating cycles is entirely electrical. The machine column is equipped with red, amber and white lights to indicate to the operator various circuit conditions existing during the operation of the machine. The red and amber lights are controlled by limit switches, the white work light indicating when the power is connected but turned off during the automatic cycle of operation. The operating cycle can be terminated at any time by pushing a stop button. The machine is equipped with two sets of work centers having a maximum distance between them of 97 inches. Work weighing more than 2500 lbs. can be supported between the larger of the two pairs of centers. Thus the

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Simply fill out the card, indicating the information or service you desire, and mail. Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described. In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

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USE THIS CARD for requesting additional information or bulletins relative to new equipment, materials, processes, etc.

USE THIS CARD when answering advertisements, to obtain specific information on problems or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

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USE THESE *FREE* REPLY CARDS

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ANSWERING ADVERTISEMENTS
Requesting:
LITERATURE
REPRESENTATIVE TO CALL

SPEED-UP PRODUCTION— LOWER COSTS

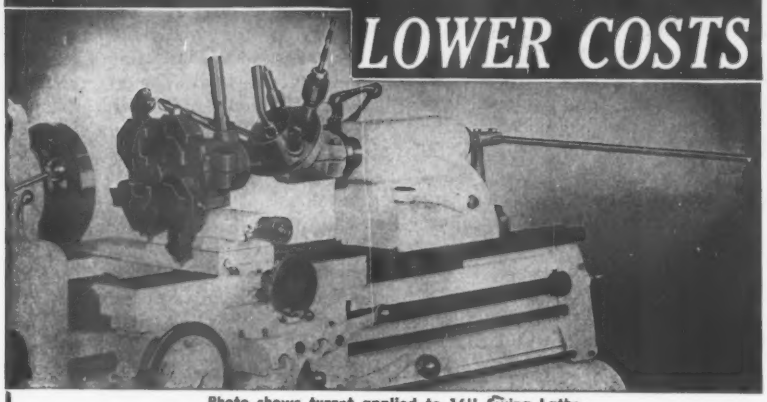
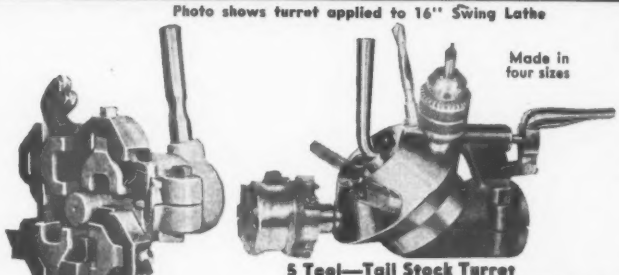


Photo shows turret applied to 16" Swing Lathe



Made in four sizes

5 Tool—Tail Stock Turret

4 Tool—Tool Post Turret

Made in two sizes

CONVERT ENGINE LATHES

Here's a quick and economical method of converting your engine lathes into complete, accurate turret lathes—by installing the Jefferson Tail Stock Turrets, the Jefferson Tool Post Turrets and the Jefferson Adjustable Pull-Feeds.

These sturdy, precision attachments have in many cases made it possible to double productive capacity — because nine different tools are quickly available at all times — independently or collectively.

Any kind of work may be done quickly and efficiently—forming, roughing, boring, finishing, knurling, drilling, tapping, etc., without stopping lathe or changing tools.

DELIVERY 10 DAYS

Jefferson Turrets are real production tools—substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market.

We also manufacture Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles and Milling Machines. Let us mail bulletins giving full details.

JEFFERSON MACHINE TOOL CO.

Sweeney, Cutter and Fourth Sts. Cincinnati, Ohio

When ordering new lathes, be sure to specify Jefferson Turrets.

WELDON ROBERTS

Brightboy

REG. U.S. PAT. OFF.

for POLISHING and FINISHING METALS

The *SOFT RUBBER* binder *CUSHIONS* the abrasive

A TIME-SAVER IN DEFENSE INDUSTRIES

Speeds up finishing and polishing after grinding and abrasive operations

★ *Prompt Deliveries* by your mill supply house

BRIGHTBOY INDUSTRIAL DIVISION

WELDON ROBERTS RUBBER CO., NEWARK, N. J., U. S. A.

Having difficulty holding tolerances?

FLOATS RADIALLY

DEMAND THE

ZIEGLER

ROLLER DRIVE

Floating Holder

for

Taps and Reamers

AUTOMATICALLY compensates for machine spindle misalignment, eliminating over-sized or bell-mouthed holes.

Helps produce unbelievable accuracy on both new and old equipment.

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

W. M. ZIEGLER TOOL CO.

1920 Twelfth Street DETROIT

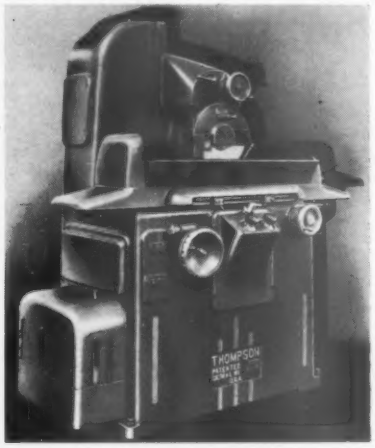
machine can handle a gear mounted on its shaft, thereby eliminating any possible errors in concentricity due to mounting the gear on the shaft.

THOMPSON (F82) TOOL ROOM GRINDER

A new high speed Surface Grinder is announced by the Thompson Grinder Company, Springfield, Ohio. It has been developed to meet the demand for a small, sensitive, high speed tool room and production surface grinder, which will maintain its initial accuracy for a long period of years without constant maintenance. It is of the sliding head type, with horizontal spindle, grinding with the periphery of the wheel with reciprocating table. It is equipped with both hydraulic and hand feeds to the table and wheel head movements.

The bed is of the double length box type which houses both the coolant and hydraulic systems, making the machine an entirely self-contained unit. The control panel is inclined which places the work and controls with the normal vision of operator. The micrometer stop above the elevating handwheel can be supplied as an extra. With the use of this positive stop, average skilled operators can grind to .0001" limits without difficulty it is said. The extra heavy alloy steel spindle is mounted in super precision ball bearings accurately preloaded. The grinding wheel is 12" x ½" x 1¼", powered by a 1½" hp two-speed motor. The high speed push button is interlocked mechanically with wheel diameter, making it impossible to overspeed the grinding wheel.

All working parts of the machine are said to be readily accessible. The pump motor, hydraulic pump and coolant pump are housed in a recess at the left end of the machine, and can be inspected by the removal of a louvred shield. The wheel head and pump motor switches are also mounted in a cove of the base just above the hydraulic unit. Push buttons are recessed in the front of the base to prevent accidental contact. Oil resistant wire covering and coolant hose is provided as standard equipment.

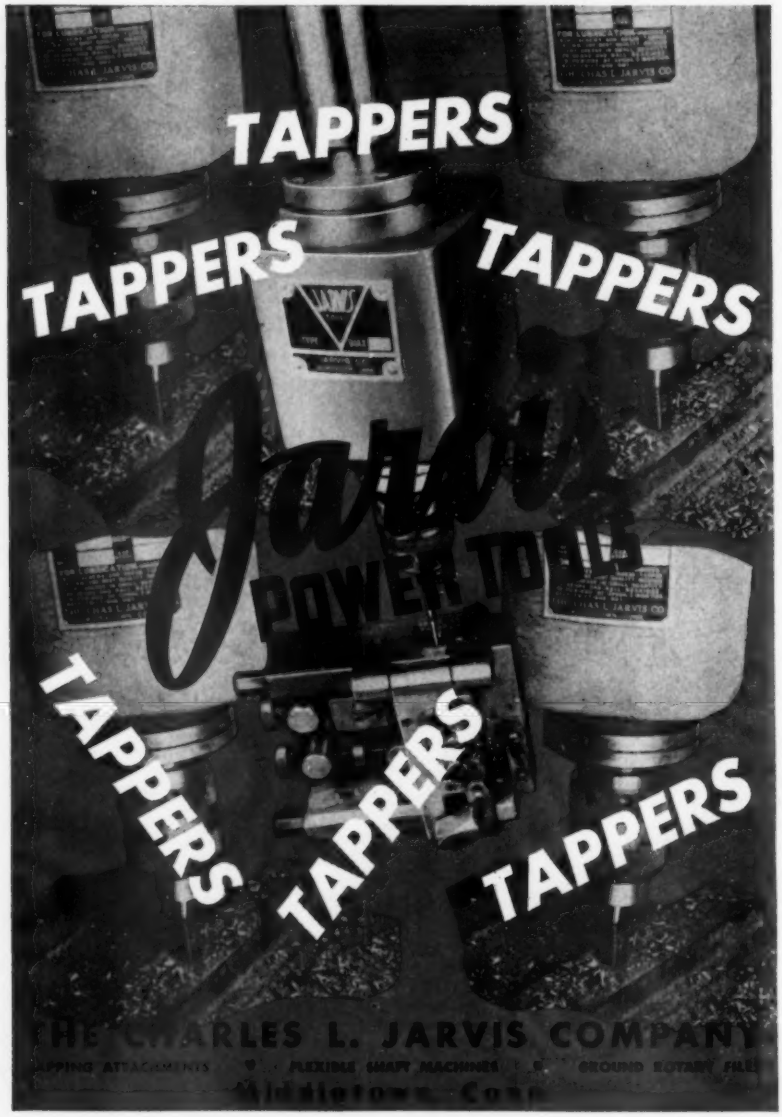


Thompson Grinder
The initial accuracy is maintained.

SIMPLEX (F83) SHELL CENTERING

A new machine for speeding up production of heavy artillery shells is announced by the Stokerunit Corporation, Milwaukee, Wisconsin. This Simplex Shell Centering Machine is a high production machine designed specifically for the work of centering high explosive shell bodies for the succeeding machining operations. Shells can ordinarily be centered and returned to the conveyor in 30 sec. A production of 100 shells an hour can be maintained at 85% efficiency in continuous operation.

The machines are easily handled by unskilled help with a very short instruction. All that the operator is required to do is to roll the shell from conveyor to work tray, push the start button for the automatic cycle, and a half minute



Wishing You
A Merry Christmas
and a
Happy New Year

» » SWARTZ TOOL PRODUCTS CO.
13330 FOLEY AVE. DETROIT « «

Complete Quality Service on

PRODUCTO *Master & Standard* **DIE SETS**
and accessories

Producto Service on Die Sets and Accessories for Tool and Die Makers is nation-wide. Three assembly and shipping plants for Die Sets—six sales offices stocked with Die Makers' Accessories. Die Sets and Accessories in stock on the Pacific Coast at two points.

EAST: Factory 990 Housatonic Avenue, Bridgeport, Conn.

MIDDLE WEST: Factory 3017 Medbury Ave., Detroit, Michigan; Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.

WEST: Stock, Jos. C. Fletcher, 1415 Folsom St., San Francisco, Cal.; Frey Industrial Supply Co., 3828 Santa Fe Ave., Los Angeles, Cal.

New 100-page No. 9 Catalog gives full information.

DISTRIBUTORS OF DICKERMAN FEEDS

THE PRODUCTO MACHINE CO.
BRIDGEPORT, CONN.
and
3017 Medbury Ave., Detroit, Mich.

for Low Cost Production

***Use* DE-STA-CO Toggle Clamps**

In every operation where parts must be held in fixtures for drilling, milling, welding, assembly and the like, the production *rate* depends upon positive clamping—and instant release . . . And production *costs* likewise.

De-Sta-Co quick-acting Toggle Clamps are nationally recognized as the efficient, low-cost method of designing and carrying out production . . . Write now for Bulletin No. 41, showing types and sizes best fitted to your requirements.

DETROIT STAMPING CO.
Established Over 25 Years
356 Midland Ave • Detroit, Mich.

later roll the shell back on to the conveyor. The work cycle stops automatically. The hydraulic pressure is kept on continuously. As there is no lifting of shell bodies the work is light even with 155 mm or 6 in. shells (130-160 lbs. weight). If the centering tool should break in the work or any other mishap occur, pushing the cycle stop button immediately starts the retraction of the drill and the operations that follow to release the shell.

An electric-hydraulic, fully automatic cycle takes complete charge of the shell with the pressing of the start button, This cycle advances the table, forcing the mandrel fully into the shell against a spring-loaded stop, expands the mandrel to hold the shell firmly, drops the work tray, and starts the mandrel and centering tool revolving in opposite directions. The centering tool advances, drills the center and retracts. The mandrel releases the shell, the table returns, and the work tray comes up to receive the centered shell.

Simplex Shell Centering Machines are installed right in the conveyor line which brings up the forged shell bodies to the lathes for the first machining operation. Brackets on the side of the machine provide conveyor supports.

TANNEWITZ DI-SAWS

Do in MINUTES jobs which otherwise require HOURS!

Conservatively estimated TANNEWITZ DI-SAWS save an average of 70% of the time and cost involved in making inside and outside cuts on dies, shoes, templates and the hundreds of other operations, including filing and polishing, to which these machines are ideally adaptable. In many instances they are turning out work in as little as ONE-TENTH of the former time required.

To expedite production and cut costs, by all means investigate the tremendous possibilities these machines offer in tool and die making and other applications.

SAWING SPEEDS PER MINUTE					
THICKNESS	CAST IRON	COLD ROLLED	TOOL STEEL	HI SPEED STEEL	HI CHROME HI CARBON
¼"	16"	9"	5"	2⅜"	1½"
½"	8"	4½"	2½"	1⅛"	¾"
1"	3½"	2¼"	1¼"	½"	⅜"
1½"	2"	1"	⅝"	5/16	3/16"
3"	1"	½"	5/16"	5/32"	3/32"
6"	½"	¼"	5/32"	5/64"	1/32"

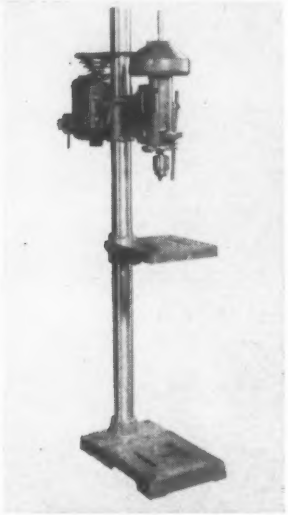
The popularity of DI-SAWING is growing by leaps and bounds. Get the complete facts on the most highly developed DI-SAW on the market. Simply write for our DI-SAW Bulletin.

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

TAYLOR DRILLING MACHINE (F84)

A new Ball Bearing Drilling Machine is announced by the Taylor Mfg. Co., Milwaukee, Wisconsin. This machine is said to embody a number of features which are not usually found in average drill presses on the market. Included among these, according to the manufacturer, are a modern design which provides ease of operation, economy and ready accessibility of parts; sturdy construction throughout assures dependability in drilling service and long life; and a full drill size range capacity which eliminates frequent setup changes and additional drilling equipment. The machine has oversize ball bearing spindle for smooth operation and efficiency and positive lubrication. There is a depth of cut gauge and a swivel work table included as well as Jacobs key-type chuck. The machine is driven with a 1/3 h.p. motor and a "V" belt power drive with four spindle speeds. The machines are available in bench or floor type.



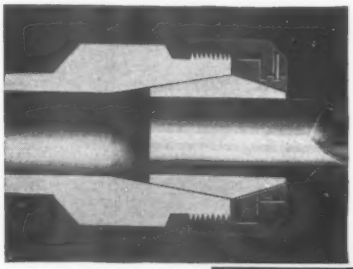
Taylor Drilling Machine
Has a full drill range capacity.

GISHOLT TOOL SLIDE (F85)

A new rapid slide tool for turret lathes has recently been announced by the Gisholt Machine Company, 1229 East Washington Avenue, Madison, Wisconsin. This tool is designed to hold small boring bars and forged cutters.

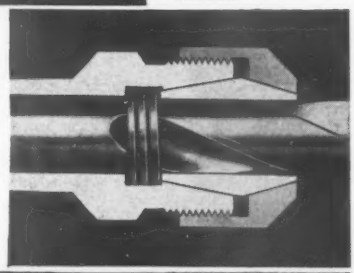
Movement of the lever transmits a rapid, smooth motion to the slide per-

2 NEW FEATURES IN UNIVERSAL COLLET CHUCKS

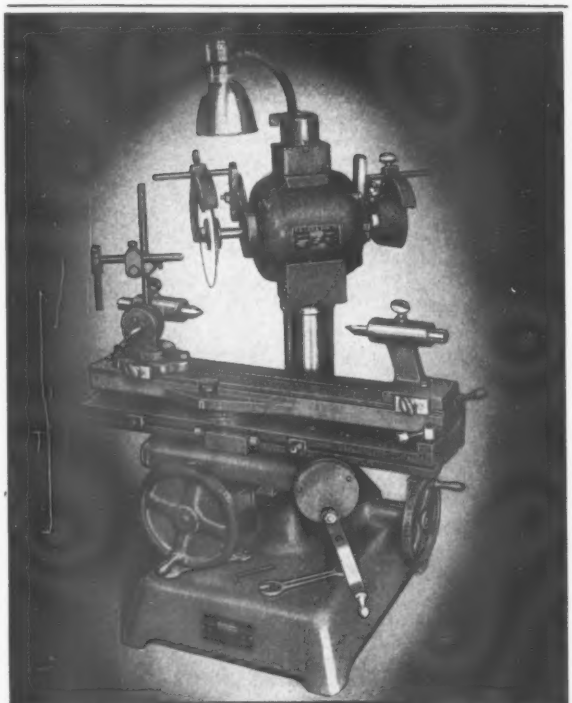


In larger sizes Z, ZZ and XZ nut tightens against a floating sleeve which reduces locking effort by 50%. Nut is jet black and fluted for tightening with a spanner wrench.

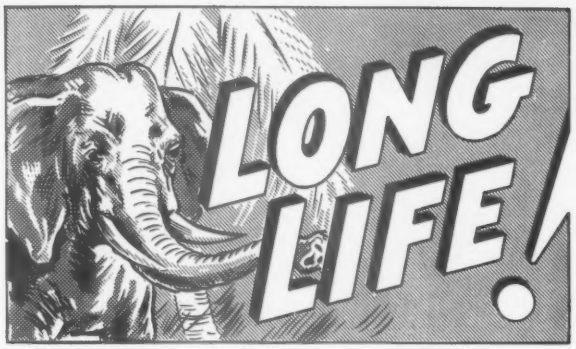
In smaller sizes OW, WW, and Y a release spring forces collet forward, as nut is loosened, automatically releasing the grip on the tool.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

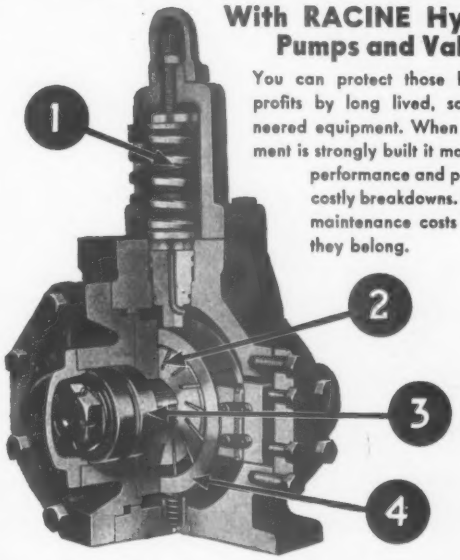


The New Model A600 Tool and Cutter Grinder
Our Bulletin TCG41-12TE will give you all important details.
K. O. LEE COMPANY
Aberdeen, South Dakota ★ U.S.A.



With RACINE Hydraulic Pumps and Valves

You can protect those hard to get profits by long lived, soundly engineered equipment. When your equipment is strongly built it maintains peak performance and prevents those costly breakdowns. It keeps your maintenance costs down where they belong.



Here are four reasons why RACINE Variable Volume Hydraulic Pumps are exceptionally long lived. They are important when maintaining continuous working pressures of 1000 pounds per square inch with deliveries of 12, 20, and 30 gallons per minute.

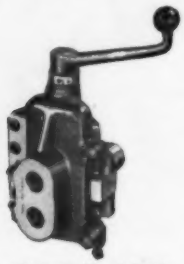
1. Shock absorbing governor automatically protects your equipment from hydraulic hammering by absorbing momentary shock pressures thus maintaining even pressure control.
2. Tilted hydraulically Balanced Vanes cannot seize or stick and are polishers rather than gougers of the chamber ring. No wearing here!
3. Big Rugged Roller Bearings support the husky shaft, that extra strength to stand maximum loads day in and day out.
4. True circle pressure chamber ring accurately finished imparts, smooth harmonic motion to the vanes. No chattering or uneven vane action to cause gouging.

These features mean low cost, long lived hydraulic power to you when you use RACINE Variable Volume Hydraulic Pumps. RACINE also has a full line of hydraulic balanced piston type valves from which to select the exact controls to meet your requirements.

Write for our free catalogs or better have one of our competent representatives located nearest you call. They will be glad to lay out working circuits with you without obligation wherever our equipment can be profitably used. Write today!

RACINE TOOL AND MACHINE COMPANY
1777 STATE ST. RACINE, WISCONSIN

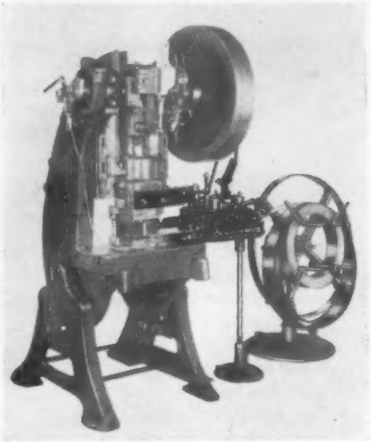
mitting back-spacing and recessing operations to be performed quickly. Adjustable stops are provided for quick setting, permitting duplicate work. In writing for additional information on this tool specify size of lathe on which it is to be used.



Gisholt Tool Slide
For small boring bars and forged cutters.

WITTEK ROLL FEED (F86)

An Automatic Roll Feed and Reel Stand designed for rapid, smooth and accurate feeding for punch press operation, manufactured by The Wittek Manufacturing Company, 4307 West 24th Place, Chicago. The rolls of the feed turn constantly, while the forward movement of the stock is arrested momentarily by release of the rolls to allow for stamping operation and ejecting of the stamped part. Power for driving the feed is transmitted by chain from a sprocket mounted on the crankshaft of the press to a sprocket on the drive shaft of the feed. Adjustable chain tightener takes up the slack and permits the use of interchangeable sprockets for any desired ratio between the press and the feed.

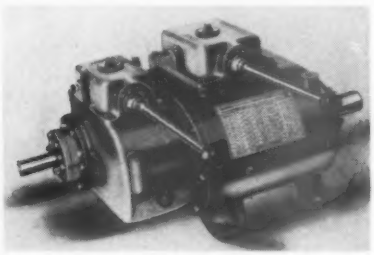


Wittek Roll Feed
Smooth feeding for punch presses.

WESTERN TRANSMISSION (F87)

A new Western Super Transmission with 30 hp capacity for motorizing cone driven machine tools is announced by Western Manufacturing Company, Detroit.

It is said to be suitable for replacement of gear boxes on large boring mills, radial drills and can be used to motorize large slotters, engine and turret lathes. This transmission has eight changes of speed in geometric progression. All gears and shafts are made of alloy steel, heat treated. Shafts run on anti-friction bearings. Case is provided with oil seal.



Western Transmission
For replacing gear boxes.

MORE TIME ON THE MACHINE!

LESS TIME ON THE WHEEL!

TECO CARBIDE TOOLS

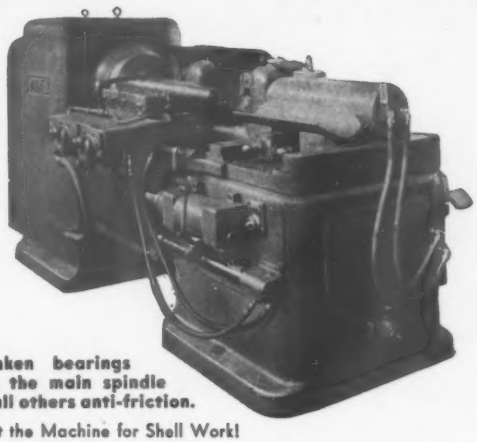
The real test of any cutting tool today is how MUCH — how FAST — how LONG it can produce between grinds. Judged by these vital standards, TECO CARBIDE TOOLS give you the "edge" for high speed turning, boring and facing on toughest ferrous and non-ferrous metals. How much? 10 to 50 times more pieces per grind. How fast? 4 to 11 times faster than high speed steel. How long? As much as 200% longer tool life. Proof? Try Teco Carbide Tools in your own plant. All grades and styles to meet practically any machining needs. Let us know your requirements.

TECO CARBIDE TIPS FOR IMMEDIATE SHIPMENT

Complete range of standard grades, styles and sizes for brazing to your own tool shanks. Order today — no waiting.

TUNGSTEN ELECTRIC CORPORATION
570 39th Street • • • Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Pioneers in Tungsten Carbides for Over a Quarter Century

MOREY "27" SEMI-AUTOMATIC HEAVY DUTY LATHE



Timken bearings for the main spindle —all others anti-friction.

Just the Machine for Shell Work!

Suitable for rough or finished turning shells at maximum feed.

Put your shell operations on this fast powerful lathe and turn out your work at top speed up to the limit of tool capacity.

Multiple tool holders can be supplied at front and rear; a turret mounted on separate saddle can be used instead of tailstock.

Full use of carbide tools can be taken by this heavy duty lathe.

Ask for Circular No. 715

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

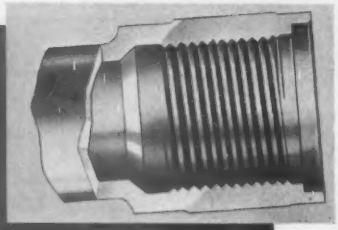
ARMSTRONG

LATHE AND MILLING MACHINE DOGS

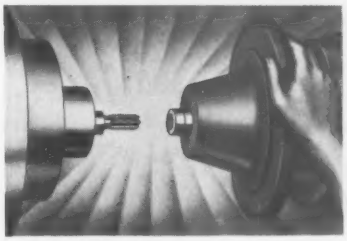
Because they are correctly designed and balanced and are drop forged from tough open hearth steel, heat treated to extreme stiffness . . . because they have alloy steel screws that are hardened at the point to prevent up-setting, and have oversize hub that permit retapping . . . ARMSTRONG Drop Forged Lathe and Milling Machine Dogs ***have double life*** . . . are universally recognized as the finest obtainable. 11 types, all sizes. Write for Catalog.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
360 No. Francisco Ave., Chicago, U. S. A.
Eastern Sales: 199 Lafayette St., New York

45 ACCURATE DEFENSE PARTS PER HOUR!



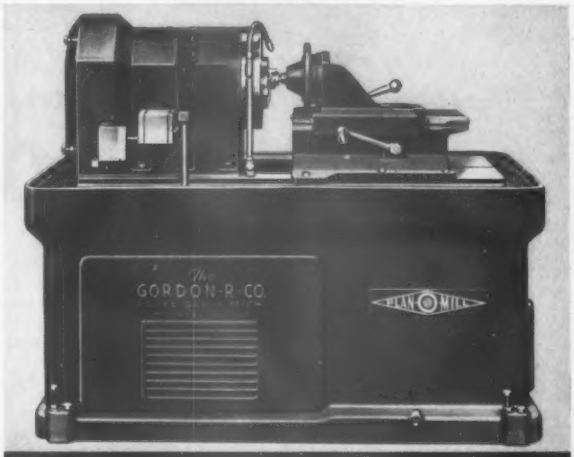
● One of the many tough jobs performed by Plan-O-Mill. From the internal and external threading, spot-facing and chamfering of parts from ½" diameter to 20" diameter . . . Plan-O-Mill sets milling standards for accuracy and ease of operation. On cylinder heads, spark plugs, breech blocks, propeller hubs and blades, fuel injector parts, shells, and many other defense parts—Plan-O-Mill meets the closest tolerances.



● Plan-O-Mill on the job: The operator inserts shank of part in holding fixture, presses operating button. The part is held rigid! 45 fuel injector parts are threaded and formed automatically every hour.

Send us your problem! Plan-O-Mill is being delivered promptly to meet defense production deadlines. Write, wire, or phone. Literature available. A milling engineer who understands plant operations is ready to call at your shop.

PLAN-O-MILL
REG. U.S. PAT. OFF.



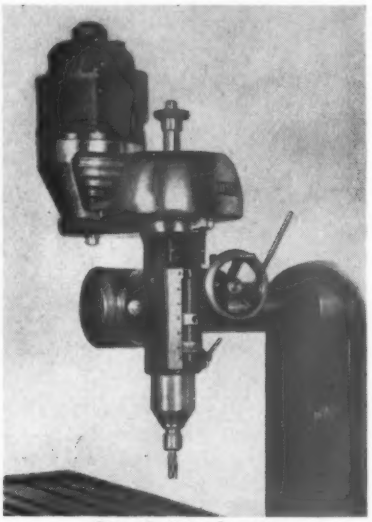
The GORDON-R-CO.
627 Washington Square Bldg.
Royal Oak Michigan

RUSNOK ATTACHMENT (F88)

A new motor driven Milling-Drilling-Boring Attachment, is said to be specially designed to meet the demand of the metal working industry for heavier duty end mill operations, is announced by the Rusnok Tool Works, Chicago. The attachment has a large size spindle, with No. 9 B & S Taper, and Timken tapered roller bearings. The ½ hp motor with V belt drive has six speeds. The spindle takes 1/16" to ¾" end mills. The Quill is hardened and ground, and counterbalanced with a full 4" travel. The housing is graduated 360 degrees with a locking micrometer depth stop and quill lock. All overarm brackets are fitted with a spreader screw for easy mounting.

DOALL RECTIFIER (F89)

Simple, compact, inexpensive are said to be features contained in the Doall Rectifier just released by the Savage Tool Company, Savage, Minnesota. The Doall Rectifier will be of special interest to those plants where alternating current must be transformed into direct



Rusnok Attachment
Milling—Drilling—Boring.

current for the operation of electro-magnetic chucks. There are no moving parts to wear out or servicing costs as is common in motor generator plants.

Packed in a self-contained 11" x 4¾" x 7¾" welded steel case, the Doall Rectifier is operated from a toggle switch

Doall Rectifier
For operating Magnetic Chucks.

and contains a built-in pilot light to show when it is in operation. The unit is completely fused to prevent damage to either Rectifier or magnetic chuck. Built specifically for operation of electro-magnetic chucks supplied with the Doall grinders, the Rectifier, however, will operate any electro-magnetic chuck of from 6" x 18" to 8" x 24" in size.

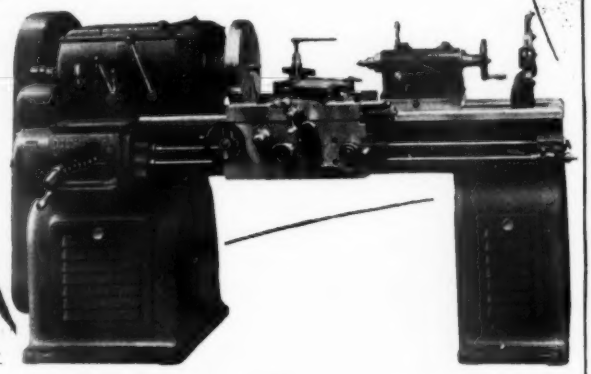
DIAMOND TOOL LOC-KEY-SET (F90)

The Diamond Tool Company, Chicago, announces a new design feature which is to be incorporated in all dia-

Can you answer these questions?

AN INDUSTRIAL QUIZ

What lathe has ruggedness?
What lathe has unlimited feeds and speeds?
What lathe provides accuracy?
What lathe allows heaviest cuts, free from chatter marks?



Sure, you know the answer . . .

BRADFORD

GEARED HEAD LATHES

Bradford Lathes can step up your production. Twelve selective speeds —ranging from 16 to 400 RPM—Timken Bearings or taper bronze bearings, on high carbon steel spindle—hardened alloy steel gears running in oil—quick change gear box for selective speeds and thread cutting—an unlimited range of feeds and speeds through the quick change device—accurate spindle control.

Send for Free Bulletin that gives full details and specifications

Also manufacturers of Unit Type Drilling and Tapping Machinery

THE BRADFORD MACHINE TOOL CO.
657-671 EVANS STREET
CINCINNATI, OHIO

THE ACME JIG BUSHING CATALOG

Can be seen from two sides

One is GREEN for the A.S.A. Standard
One is RED for the Acme Standard

Together these standards furnish the most complete selection of standardized jig bushings available.

Write for this catalog. It will help with the selection of bushings for your jigs and fixtures.

ACME INDUSTRIAL COMPANY

Specialists in Flat and Cylindrical Lapping

ACME

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MONroe 4122

Chicago Rawhide Mallets and Hammers are the best tools you can buy for protecting surfaces when they need to be pounded.

Genuine Java Water Buffalo Hide will not split, crack or break. The hydraulically compressed heads of Chicago Rawhide Mallets and Hammers are safe to use and safe to handle. Hammers have replaceable faces in malleable iron heads. These economical tools are made in sizes and weights for every purpose. You can get them through your dealer. The next time you buy, ask for Chicago Rawhide tools.

CHICAGO Rawhide MFG. CO.
1393 ELSTON AVE · CHICAGO · U·S·A·

Get DOUBLE DUTY *out of your drill presses with* Ettco-Emrick TAPPING ATTACHMENTS

• SIZES FOR NO. 0 TO 1" TAPS

OUTSTANDING FEATURES

- SENSITIVE FRICTION CLUTCH — provides a positive drive that releases the instant tap sticks or bottoms. Long-wearing friction members are replaceable as a unit in a few minutes.
- TAP IDLES IN CUTTING DIRECTION — prevents chamfering hole; speeds up tapping; doubles tap cutting edge life.
- AUTOMATIC REVERSE
- BALL-BEARING MAIN SPINDLES
- NEEDLE BEARINGS ON INTERMEDIATE SHAFTS
- ALL HELICAL GEARS—quiet, efficient.
- FOOL-PROOF TAP CHUCK — has positive, visible grip.
- QUILL CLAMP—can be furnished for fastening attachments to any drill press — assures rigid mounting.

THERE'S no need for your drill presses to be idle when they're not drilling. By simply clamping Ettco-Emrick Tapping Attachments to their spindles they become high speed, sensitive tappers. And when you want to go back to drilling, it takes only a couple of minutes to take off the attachments.

But don't get the idea that this is a "make-shift" tapping arrangement. These time-tested and proved Ettco-Emrick attachments will turn out tapped holes as ***accurately*** and as fast as machine tapping can be done. You'll find the reasons why in the exclusive design and construction features listed at the left.

FULL DETAILS about these attachments, and prices, are given in BULLETIN No. 2. Write for a copy—today.

SAVE TIME in solving your tapping problems. Our 25 years of specialization in machine tapping are always at your service. Write us.

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn, N. Y.

DETROIT • CHICAGO

The Famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

mond nibs in the future. This new feature which is known as the "Loc-Key-Set", consists of two internal locking keys that are integrally cast on the slug-holding nib by forcing the molten metal into two internal key seats milled in the nib head. It is claimed that diamonds set in this manner never shift, turn or loosen in operation, making possible micrometer adjustment of each pass. Other features which are claimed for these nibs are: a large diameter head which draws heat away from the grinding point and dissipates it rapidly, providing cooler dressing and preventing tool expansion and permitting the holding of closer tolerances, and corrected face angles which permit greater tool clearance without loss of tool strength or rigidity.

JEFFERSON MILLING MACHINE (F91)

A small motor driven precision milling machine is offered by the Jefferson Machine Tool Company, Cincinnati, Ohio. It is of "Bull-Dog" design and is said to combine speedy and absolutely accurate production with ease of operation and long and hard service.

It is claimed that this is the most economical milling machine for such operations as die sinking, contour profiling, angular milling, jig boring, routing of ferrous and non-ferrous metals.

Spindle is mounted in tapered Timken Roller Bearings. Other features are slides dovetailed, gibbed, and hand-

Diamond Tool Nibs
Two internal locking keys.

scraped to perfect alignment, it is said. Gibs are adjustable for take up in time of wear. Positive locking arrangement of table, knee and saddle. Power feed with adjustable positive automatic stop.

Jefferson Milling Machine
The design is sturdy.

Table is equipped with three T-slots. All feed screws have been minutely and accurately machine threaded — these screws having dials which are graduated in thousandts of an inch. The vertical feed screw is operated by bevel gears.

SPEED TREAT STEEL
.40-.50 CARBON OPEN HEARTH
X1545
1. DUCTILITY
A 1" Rd. Cold Drawn Bar will take a 90° Bend Cold Without Fracturing, Splitting or Breaking.
2. INCREASED PRODUCTION
3. MACHINABILITY
4. STRENGTH
5. HEAT TREATMENT
JOBBERS NOTE!
Speed Treat Steel offers a splendid opportunity to reduce your inventory and still satisfactorily serve your customers.

Licensor
MONARCH STEEL COMPANY
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YOUNGSTOWN, OHIO

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

CONSERVE HIGH SPEED STEEL

BY USING OK INSERTED-BIT TOOLS

You'll Give National Defense a Boost
You'll Make Your Cost Sheet Look Better

THERE'S not nearly enough H. S. steel to go round. Putting it into tool bodies was **always** a waste. Today it's worse than waste!

Instead of using solid tools for your lathes, planers and shapers, change over to OK Inserted-Bit Metal Cutting Tools like those shown here. In these, only the cutting edges are of H. S. steel. The bodies (which do no cutting) are of drop-forged chrome nickel steel, heat treated for strength. The H. S. steel thus conserved often runs as high as 60% and 70%—and the shop speeds production and lowers costs. This same principle is also embodied in OK Milling Cutters, available in all designs.

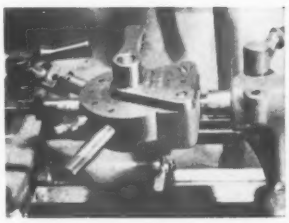
If you will describe your problem, we'll be glad to make practical recommendations without obligation.

MODERNIZE WITH TOOLS LIKE THESE

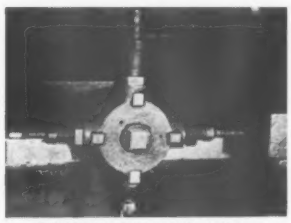
THE O K TOOL CO., SHELTON, CONN.

INSERTED-BLADE METAL CUTTING
TRADE OK MARK
TOOL SYSTEM

WHY NOT JOIN THE FRONT RANKS OF PRODUCTION



QUADRUPLEX TAILSTOCK TURRET
$15.00 F.O.B. BLOOMFIELD, N. J.



QUADRUPLEX LATHE STOP
$15.00 F.O.B. BLOOMFIELD, N. J.

THE ultimate of efficiency is doing even the smallest job in the least amount of time yet doing it well. A multiple operation QUADRUPLEX TAILSTOCK TURRET head eliminates that small run nuisance by doing on an engine lathe what would ordinarily be done in a tool room or on a turret lathe with a costly set-up. A four position micrometer set QUADRUPLEX LATHE STOP, by a mere flip of the finger, gives you accurate distances for work being done with the compound.

An inquiry today will save time and money tomorrow.

Immediate delivery from stock.

SPECIALTIES MANUFACTURING COMPANY, INC.

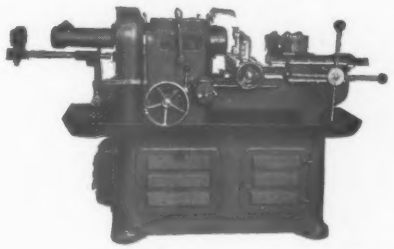
Dept. T-1 **Bloomfield, N. J.**

MOREY No. 2G & No. 3 Turret Lathes

Motor Drive

INFINITE SPINDLE SPEEDS

Timken Bearings for the Main Spindle—All Others Anti-friction



	No. 2G	No. 3
SPEEDS from	90 to 1800 R.P.M. or 180 to 3600 R.P.M.	60 to 2100 R.P.M. or 100 to 3600 R.P.M.
CAPACITY	1"x6½" turning length	1½"x9" turning length Made in Plain and Universal Types
	Ask for Bulletin No. 629	*Ask for Bulletin No. 727*

Any spindle speed you want—a direct reading dial shows when you've got it.

Permits the use of carbide tools for fast cutting.

Turret clamps and unclamps automatically.

Equally effective on second operation and chucking work.

MOREY MACHINERY CO., INC.

410 Broome Street **New York, N.Y.**

Handy Andy Says—

AM writing this during the lethargy following a replete Thanksgiving dinner, by which token I'm past the deadline but in good time to wish you all a Merry Christmas and a Happy New Year. Christmas, of course, is dedicated to Peace on Earth and Good Will to men, and it's too bad that a minority of screwballs should have made a hollow mockery of the Message. Yet, though we give it lip service, we are reminded that there are nations that are content to live and let live, and in time these may establish a precedent for universal peace. As Canada and the United States, for example. And fittingly, there was unveiled in Detroit, this previous Armistice Day, an international peace monument which reads: "DEDICATED TO THE GLORY OF GOD AND TO THE PROMOTION OF UNDERSTANDING AND FELLOWSHIP BETWEEN THE PEOPLES OF THE DOMINION OF CANADA AND OF THE UNITED STATES OF AMERICA. A.D. 1941". And be it remembered that the year 1941 also marked the first International Convention of the A.S.T.E. in Canada, when there was also pledged understanding and fellowship between kindred peoples. May the Spirit of Peace abide with us forever.

▼ ▼ ▼

As a result of a journalistic debate (to call it that) between a certain Near Editor and Y'rs Truly, I am a recipient of numerous clippings as well as advice, both pertinent and impertinent, from hither and yon. One correspondent cautions me against accepting an invitation to a fishing trip by my opponent who, it is alleged, likes to take his victims (?) out where the waves roll high and complexions turn green as a consequence. Well, I'll not worry about that, not expecting an invitation besides which my dime store tackle would be entirely out of place alongside millionaires' gear. But as for the high seas, well say! Where I came from the kids used to loop the loop inside the combers and they weren't curling in the blue waters of the Gulf Stream by a long ways. Yessir, gentlemen, I've rode 'em in gale and smother and never a qualm to spoil my appetite for pork and beans. Don't kid me about the rolling wave!

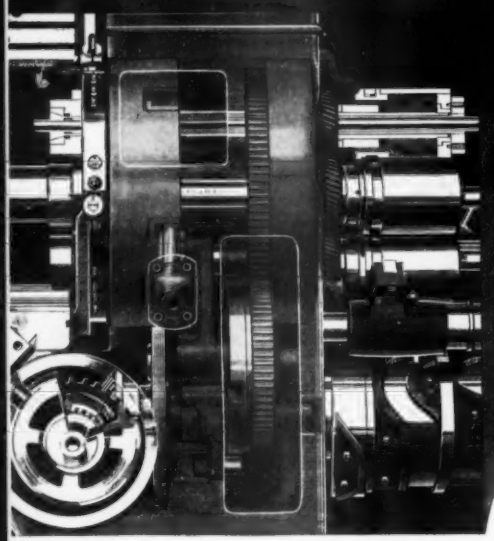
▼ ▼ ▼

As for Lindbergh, I am no hero worshipper and can concede faults to him that his severest critics haven't even mentioned. I defended him, not so much for the things which he has said but for the things which he hasn't said but which have been imputed to him. Moreover, I hold him utterly sincere if as utterly tactless; the unfortunate thing is that there have rallied to his standard, among other sincere isolationists, subversive forces which are not for America first, but last. Yet, when it can be established that he gave false witness regarding Germany's advantage in aviation and military preparedness, or that Russia's vaunted military might was but an Utopian dream, then it will be time to impugn his veracity. And I still say that, had the democracies heeded his warning, and acted, the war might be on a different footing today. Well, Lindbergh is not popular and each to his prejudices, but personally, I'd rather have facts, however unpleasant, from a clay idol than wishful thinking from a demigod. One thing among others that I hold against Lindbergh is that crack about annexing Canada. As you were, Canada!—and be as you are, friendly and courteous, a fine neighbor.

▼ ▼ ▼

I further hold that America can repel invasion by a foreign power, nor was my

SHOCKLESS *and* TIME SAVING *Indexing*



The "all-out" call for speed and more speed on defense parts put thousands of peak production automatics on 24 hour schedules. Under these conditions, what about *machine life?*

Acme-Gridley

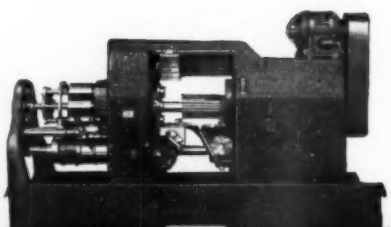
● Acme-Gridley 4, 6 and 8 spindle Bar Automatics incorporate many "life insurance" refinements that enable them to meet this endurance test.

For example—take spindle carrier indexing. On some jobs these machines index faster than 30 times per minute.

The Acme-Gridley type indexing mechanism gives the carrier a gradual and smooth start, a rapid acceleration and a cushioned stop—PROTECTION FROM SHOCK.

Refinements such as this support our guarantee of *SUSTAINED* accuracy at the fastest feeds and highest spindle speeds that cutting tools can safely stand.

LOW REPAIR COSTS • LONGER LIFE • HIGHEST PROFIT INVESTMENT



NATIONAL ACME

170 EAST 131ST STREET • CLEVELAND, O.

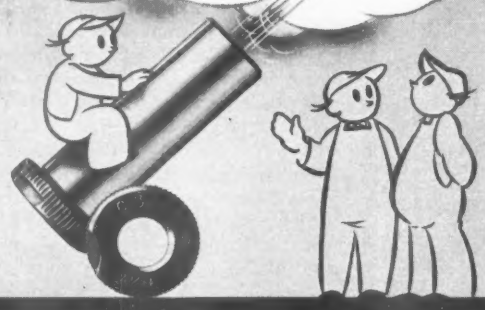
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

Universal

DRILL BUSHINGS ARE SPEEDING UP DEFENSE PRODUCTION

In scores of defense and manufacturing plants Universal drill bushings are doing an outstanding job.

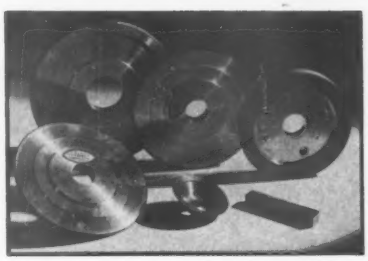
Because of their super-finished bore straight and round within .0001 Universals assure accuracy and unexcelled wearing qualities. All standard sizes available. Write for facts and prices.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

SECOMET
DIAMOND WHEELS

for...
FAST Cutting
HIGH Finish
LONG Life!



With SECOMET Diamond Wheels, cemented carbide tools are sharpened in a fraction of the time required by other wheels . . .

Tools receive a more accurate, sharper, flatter surface, and no lapping is required . . .

Tools may be reconditioned down to a minimum of tip thickness. . . . Write for full details of any type of diamond wheel. No obligation.

J. K. SMIT & SONS, INC.
157 Chambers Street, New York, N. Y.
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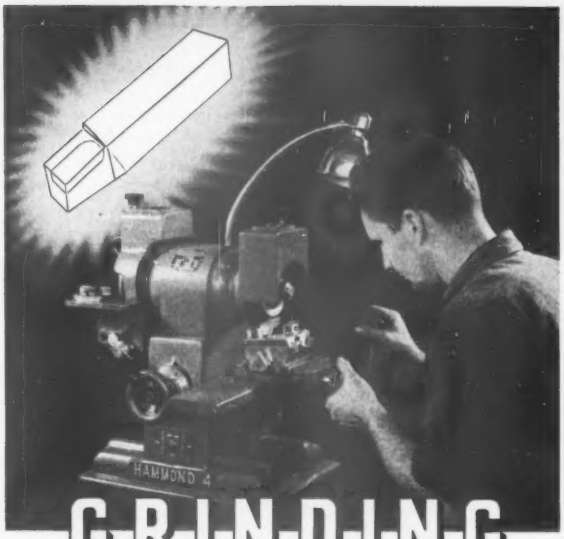
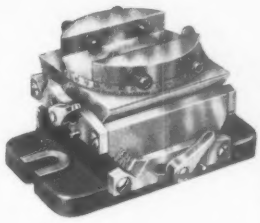


GRINDING
CHIP-BREAKERS

Chip Breaker grooves, properly ground into your carbide tools, mean higher production, less danger to operators and hold broken-tool losses as low as 1½ per cent! To grind 'em right requires a flexible and highly accurate machine . . . and that, plus dependability and endurance, is what you get in . . . .

THE HAMMOND "4"

. . . a truly modern chip-breaker grinder. Uses 4" diamond wheel, right side, over an "Any-Angle" vise . . . sensational new tool holder. Adjusts on 3 separate planes to any desired compound angle. A modern system of calibrated controls simplifies adjusting for the proper "rake," and grinds it quickly, accurately. Machine's left side carries 6" cup wheel for rough or finish grinds. Complete carbide tool maintenance all in one versatile machine.



HAMMOND "ANY-ANGLE" tool vise. Now sold separately on a lug base, this revolutionary device is also standard equipment on all Hammond "4" Chip Breaker Grinders (as above). Highly machined steel blocks, cradled together, slide instantly, easily to any angle adjustment and lock there rigidly . . . no deflection. For complete information . . .

WRITE FOR BULLETIN TODAY!

Hammond of Kalamazoo
HAMMOND MACHINERY BUILDERS, INC.
1636 DOUGLAS AVE. . . . KALAMAZOO, MICHIGAN
Eastern Branch — 71 West 23rd Street, New York City

Gentlemen:

Please send descriptive literature and prices on machines checked below:

☐ *HAMMOND "4" CHIP BREAKER GRINDER*
☐ *HAMMOND "ANY-ANGLE" TOOL VISE*

allusion to "millions of . . . . . doughboys" altogether inspired by overdue optimism even though my worthy opponent points out that there are only 1,500,000 in our army. Well, a half million more would be two million, which, being plural, would make it millions. Make a liar out of a guy for a measly 500,000 men, will he? But, what about new men being inducted, and all the boys left over from the previous international debate and who can still handle a gun? D'ye suppose a middle aged man can't shoot? And what about a legion of Nimrods who'd as soon pot an invader as they would a deer, or our host of skeet and trap shooters who'd as lief take a bead on a parachutist as on a clay pigeon? Or, do you suppose that our Intelligence would be asleep the while an enemy launched an offensive, or that our navy would be chasing rainbows or that, with transcontinental flight a matter of hours, an invading armada wouldn't run into a hornet's nest? No, I think that we're fairly secure against invasion, but as for an offensive —well, I'd just as soon that the boys who produce the goods would be a little more unanimous about supporting the boys who may have to use them. A bit of sternness on the part of the Great White Father, instead of gentle chiding, might bring that about.

▼ ▼ ▼

At that, the verbal dual has been all friendly as far as the principals are concerned, and, judging by reaction, equally enjoyed by the readers. However, my adversary stripped the buttons off the foils during one or two passes, and that would have been okay if, doggone him, he hadn't skidded on some of his oil and pricked the hide. In a letter —to be answered when and if I can dispose of previous mail—he implied that he had been pulling my leg. Oh yeah? When an anonymity like myself (I've only got to signing my name to the column recently) can lure a renowned Near Editor and an international figure to boot into printed debate, and he rises to the bait, who, I ask you, is getting his leg pulled? Anyway, thanks for the party; as previously expressed, it's been a lot of fun.

▼ ▼ ▼

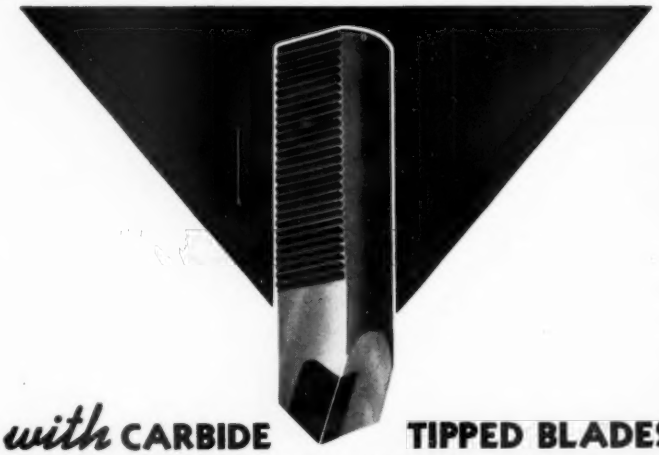
From one thing to another, I've taken to teaching again,—Tool Engineering, in case you're curious—substituting in one of the Detroit evening schools for an A.S.T.E. Engineer who, in my opinion, is far better qualified but who chose to retire as a matter of policy. At that, I'm glad to pass my own experience along to ambitious youngsters, a term which, incidentally, is but comparative since my "boys" are matured men. Whether or not I am doing them any good remains to be seen; at least, they are attentive and encourage me with their overt enthusiasm. But the point is that they are doing me good, having bolstered my faith in the coming generation of Tool Engineers. For, in an age when so many men are succumbing to paternalism and are inclined to swim with the social tide, it is encouraging that the Plus Corps carries on and on. Plus men, you know, comprise that minority which, having done its stint, uses its spare time for self improvement and, incidentally, for the advancement of civilization. On the shoulders of the Plus Men is borne all of the material and spiritual progress of the world, and as long as the minority is perpetuated, generation after generation, the world shall not retrogress.

▼ ▼ ▼

Have had numerous letters from the boys N.E.W.S. of late, and will answer in due time—say within the next few years. Connie Hersam writes and says that the boys have been kidding him about his "blood relation" but that's

(Continued on page 130)

LOVEJOY MILLING CUTTERS



with CARBIDE TIPPED BLADES GIVE COMPLETE ASSURANCE OF MORE PRODUCTION — MORE PROFITS

LOVEJOY MILLS, with cemented carbide blades, offer that extra margin of production so vital to today's requirements — PLUS economies and profits unavailable in other types of blades.

And interchangeable, POSITIVE LOCKING, LOVEJOY BLADES allow the use of practically the entire tip of this expensive material.

Stellite, Rexalloy or High Speed Steel blades are also carried in stock for immediate delivery. Whatever your milling cutter requirements, LOVEJOY can help you.

Ask for Catalog No. 26 for complete details on the modern LOVEJOY line of milling cutters.

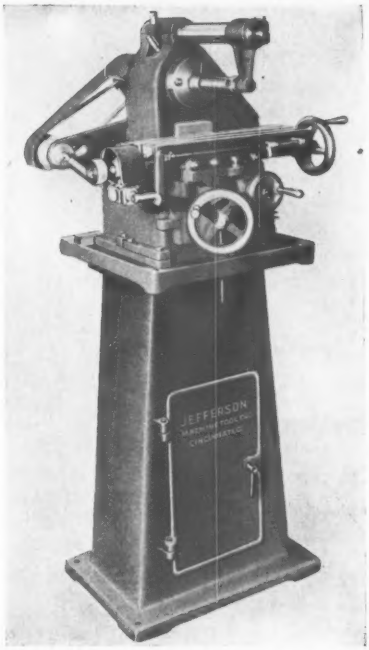
LOVEJOY TOOL CO., INC., SPRINGFIELD, VT.

"BULL DOG" MODEL JEFFERSON

MOTOR DRIVEN

PRECISION MILLING MACHINE

(Floor or Bench Type—Power Feed or Quick-Acting Hand Feed)



Write for folder or catalog describing this new machine in detail.

Also request circulars descriptive of our Jefferson Tail-Stock Turret, Tool-Post Turret, Endless Belt Sander, Swing Frame Grinder and Foundry Riddle.

The Jefferson Miller is capable of close tolerance . . . proved performance for such operations as die sinking, contour profiling, angular milling, jig boring, routing of ferrous and non-ferrous metals, and practically all other essential milling operations for production line or tool room.

The working surface (14" x 4⅜") of the table of the Jefferson Miller has an equal capacity to that of many larger and much higher priced machines and is equipped with three T slots to accommodate standard T bolts for tightly clamping of work or fixtures.

4 spindle speeds, 200, 400, 700, 1000 R.P.M.

It is so constructed that it is at all times ready for the application of a variety of standard attachments.

JEFFERSON MACHINE TOOL COMPANY

Sweeney, Cutter and Fourth Sts. **Cincinnati, Ohio**

Sellers 4T Tool Grinder

SEND FOR COPY OF 4T BULLETIN

WILLIAM SELLERS & CO., INCORPORATED

1636 HAMILTON STREET, PHILADELPHIA, PA.

FOUNDED SELLERS 1848

Sellers

GAMMONS OF *Manchester*

PRODUCTION TOOLS

ORIGINATORS AND MANUFACTURERS OF HELICAL FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

A. S. T. E. DOINGS . . . . . .

By IRWIN F. HOLLAND

Grand Rapids

The Western Michigan Chapter held its November meeting in the Browning Hotel in Grand Rapids. The meeting, a supper meeting, was attended by 65 members and their guests. After the regular business meeting, blank slips of paper were passed to each member, who was instructed to note any question he would like to have discussed by the group. Several questions were submitted and opinions given by various members. This question period was something new for this group. It was agreed to continue this at the next meeting.

The speaker of the evening was Mr. Malcolm F. Judkins, Chief Engr. of Firth Sterling Company, whose lecture was "The Making of Sintered Carbide Tip Tools" with particular emphasis on the maintenance of these tools. His lecture was illustrated with slides and motion pictures.

Mr. Judkins' lecture was very thorough and raised a lot of interest. It was finally necessary to call a halt to the questioning which followed the lecture, as Mr. Judkins' train left within a half hour.

Everyone seemed to enjoy this meeting and are looking forward to the December meeting at which time the National officers will be present.

Hartford

On Monday night, November 3, the Hartford Chapter had Colt's Night in honor of the Colt Patent Firearms Mfg. Company of Hartford. A large group from Colt's attended both the dinner at the City Club and the Technical Session thereafter. The dinner crowd was the largest of the year thus far, and was partly due to the fact that a fine talk was expected after the dinner. They were not disappointed in the least. Toastmaster of the occasion was Chapter Chairman Henry I. Moore, who introduced Dwight G. Phelps, V. President of the Colt Company.

Mr. Phelps advised the group that the main part of his talk was "off the record," but entertained the gathering very much with his wit in enumerating some of his "extra curricular" activities due to their defense work. His experiences were so humorous and well told that no one had a straight face for more than a couple minutes at a time while he was talking. At the end of his talk he announced that he was getting serious, and quoted an OPM official as stating that whereas they had been producing 2,000 machine guns per year a few years ago, they are now producing 4,000 per month. Since the accurate figures are a defense secret, Mr. Phelps could not release them, but he did say that the OPM official had been somewhat conservative. After the talk, the group adjourned to the Gas Company Auditorium for the technical session.

The session drew one of the largest turnouts that could be accommodated. Besides many guests and a very large percentage of the Chapter membership, there were some twenty-five students from the new defense training courses of Hillyer Institute, which the Hartford Chapter is sponsoring, in attendance.

Helping the MACHINE-TOOL Industry Speed National Defense!
THE excellent progress of the National Defense Program, has been due, to a large degree, to the remarkable success of the Machine-Tool Industry in providing the tools and machines which were so sorely needed.
This great industry itself has, in recent months, not only expanded its capacity in terms of enlarged space, but has naturally revamped and improved its production methods.
Almost every machine-tool plant uses a Gardner Horizontal Grinder to speed production on dozens of flat surface parts — gear cases, covers, plates and brackets. Three representative installations of 53" machines, with brief production figures, are here illustrated.
GARDNER HORIZONTAL GRINDERS will speed production on many of YOUR similar jobs—
ASK FOR BULLETINS 900 AND 902
FIG. 1. Some of the 20 jobs ground by this lathe builder, at rates ranging from 30 to 80 per hour, depending upon size.
FIG. 2. Large work handled on another 53" Gardner Grinder. Production on motor cabinet leg on the machine is 8-10 per hour.
FIG. 3. Milling machine gear cases, covers, doors, etc., produced at 22-40 per hour on this 53" Gardner Horizontal Grinder.
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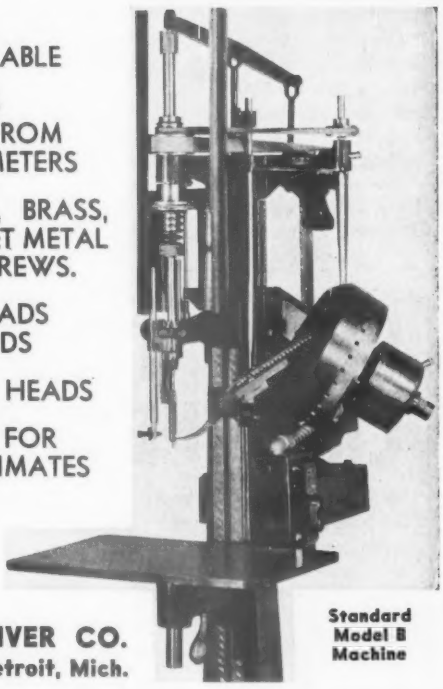

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Diamonds Set in Sintered Tungsten Carbide

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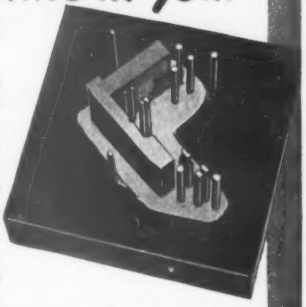

Defense demands have kept many a busy die maker awake nights. Many companies have discovered that they can greatly lighten their burden through the use of CERROMATRIX. This low-temperature-melting alloy, which expands slightly on solidifying, secures punch and die parts swiftly and accurately, eliminating most of the time-consuming fitting-and-filing labor of older methods. For example, six hours were saved in making the punch shown here.

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It was announced by Membership Committee Chairman, George Highberg, that the Chapter had twenty-two new applications for membership since the last monthly meeting.

The technical session was started by Meeting Chairman, W. P. Kirk, Sales Mgr. of the Machinery Division, Pratt & Whitney Division, Niles-Bement-Pond Company, who did a very fine job of starting the speaker off to a fine address.

The speaker of the session was Mr. Harry A. Stevens, Mgr. of Colt's Patent Firearms Company. His topic was "Present Production Methods in Manufacturing Machine Guns." He called attention to the fact that from the end of the first World War until the beginning of the present emergency there was only one manufacturer of machine guns in this hemisphere and that was Colt's.

Due to their planning and efficient organizing of details and specifications, they have been able quickly to get into production of greater quantities than ever before in half the preparation time, and have, at the same time, been able to get nine other companies also into production. This is a rate far surpassing anything in the past.

Great credit was given to the Machine Tool Industry by Mr. Stevens. This rate of production has been accomplished by the use of modern equipment that, in some cases, increases production over old methods as high as five or six times. Also they knew this time what they wanted for both tools and materials and where they could get them at the quickest possible rate. Some of the operations that have been greatly speeded up in recent years are those of milling, turning, chambering, profiling, rifling. Examples of the actual increases were given, and some samples of parts and drawings were shown. Everyone agreed that the meeting had been both interesting and very informative. The whole address as well as answers to questions afterward was as timely and instructive as anything at this time could possibly be, and was expertly delivered. It will be a difficult task for any speaker to do as good a job as was done at this meeting.

As a note of personal interest, we should call attention to the fact that both Mr. Kirk, who was meeting chairman, and Mr. A. H. d'Arcambal, who was very much in attendance, were announced the following day to have been promoted to Vice-Presidents of Pratt & Whitney. This belonging to the A.S.T.E. is really elevating.

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A few salient features are:

1. Sixteen, universal joint-driven adjustable spindles.
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4. Quick-change speed gear box (as shown) or plain pick-off gears, optional.
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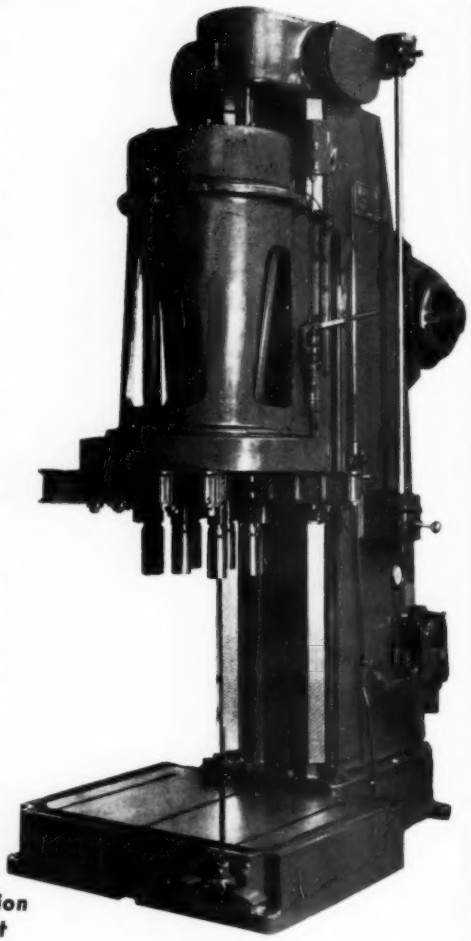
6. Capacity — Sixteen 1½-inch drills in cast iron or equivalent load.



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Los Angeles

The Los Angeles Chapter held its dinner meeting on October 9 at Scully's Cafe, Los Angeles. Seventy-one members and guests were present. Mr. C. R. Rogers, Assistant Superintendent of National Machine Products, gave a very interesting talk on "The Tool Engineer and his Production Problems." A plea for greater co-operation between the Tool Engineer and the shop man was the substance of the talk and considerable discussion was aroused. A film on "electro-coated abrasives" shown through the courtesy of Behr-Manning Company, accompanied by a lecture by Mr. P. S. Wiswell and a film on the Tacoma Narrows Bridge Collapse completed the evening's program.

Nashville

Nashville Chapter is off to a very successful year, having had this fall already three important and educational meetings. After the loss of our vice chairman, Mr. W. E. Clowminzer, who is now in Dayton, Ohio, we were fortunate in securing Mr. Stanley E. Vickers (chief tool designer) of Vultee Aircraft, Nashville Division, to fill the office of vice chairman. Other officers for the current year include:

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APEX Power Bits for Phillips screws are made of the highest quality tool steel. They are accurately machined to fit the Phillips screw snugly for easy driving. Proper heat-treatment assures maximum service in wear resistance and in number of screws driven before replacement is necessary.

APEX Power Bits will wear out—eventually. We figure that it is better to let the Bit take the wear gradually than it is to have to replace screws that have been chipped or marred by **too** tough a tool. But when APEX Power Bits do become worn, they can be RECONDITIONED at a substantial saving. Each reconditioning shortens the Bit approximately ⅛" — and an APEX reconditioned Bit is as serviceable as a new one.

Here's a thought: the new APEX Catalog on Power Bits and Hand Drivers for Phillips screws has sizes and dimensions and photographs of APEX Power Bits for nearly all makes of electric, air and spiral drivers. It is simply arranged for quick identification. Part numbers have been assigned for easy ordering. If you don't have this new catalog, we'll send you a copy. It saves your time and is a mighty handy thing to have.

Drop us a note and you'll get a personal copy. If your assistant should have one, too —okay, just ask for it.

The APEX MACHINE & TOOL Company

1101 S. Patterson Blvd., Dayton, Ohio

Mr. Horace Sprott, Chairman; Mr. L. A. Platt, Treasurer; Mr. L. V. Johnston, Secretary.

At the November meeting we were honored by the presence of Mr. Joel Fort, chairman of the local Federal Reserve Bank and also representative of the OPM in this city. Mr. Fort's subject was "Defense and Industry as Compared with the Job of the Individual." Mr. Fort emphasized that through the present emergency, personal initiative should be held high above all creeds and ambitions of the individual in order to make our defense program a success.

Greater New York

The third meeting of the year, held on November 3 in the North Ballroom of the Hotel New Yorker, was well attended by about 150 members and friends. After opening the meeting, Chairman Orchard pointed out that there were a great many firms in the New York area who were anxious to subcontract defense work and that many other small companies who were anxious to obtain such work were having difficulty in making the necessary contacts. He urged all members of the Chapter who knew of either companies having defense work or cilities available to help bring them together.

Cortland Rhodes, Chairman of the Meetings Committee, introduced the speaker of the evening, Mr. F. T. Ellis of the Heald Machine Company, Worcester, Mass. Mr. Ellis spoke on the subject, "Precision Borizing—Precision Finishing of Surfaces." Of particular interest were the illustrations cited by Mr. Ellis of the high degree of surface smoothness attainable with a single-point cutting tool when used in boring and surface finishing under precise conditions. Thus he gave one example of holes bored to within one micro-inch of absolute smoothness. They were so smooth, in fact, that they would not hold oil and subsequently had to be made rougher.

Mr. Ellis pointed out that the precision boring machine had been originally developed for the finishing of holes in place of a reaming operation. In the course of time their scope of application was broadened considerably and now they are being used for precision turning and milling operations as well.

Mr. Ellis' talk was profusely illustrated with excellent slides showing precision boring machines of various types tooled up for a large number of different production operations.

Peoria

"Broaching", covering the design, operation, and care of broach bars, was the subject of the talk given by Mr. John A. Markstrum, Chief Engineer of the Continental Tool Works, Detroit, Michigan, at the November 4th meeting of the Peoria Chapter held at the Creve Coeur Club. A large turn-out of men looking for an answer to their broaching problems listened attentively while Mr. Markstrum discussed the development of broaching, the theory of broach bar design and then showed numerous slides of broach bars and broached pieces.

After Mr. Markstrum's talk these men peppered him for over an hour with questions about his talk and about specific broaching problems. The talk and the answers were well received by the group. Preceding Mr. Markstrum's talk, Mr. John Gilchrist, Regional Director for this area, gave a brief report on the Toronto meeting and announced the increase in dues which was voted there.

Mr. Ben Hartsock was elected Treasurer to fill the vacancy created by the resignation of Mr. Henry Eiermann who has moved to Chicago.

Pittsburgh

The November meeting of the Pittsburgh Chapter was held at McCann's Restaurant, Pittsburgh, Pa., on Friday

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Small but mighty is the Dumore No. 14 Tom Thumb, here used in sharpening a hob. It is a rugged little member of the Dumore family with pre-loaded ball bearing spindle with positive lubrication, removable tool post and precision design of frame, as well as Dumore's interchangeable chuck set-up for internal work. Wt. 6¼ lbs., 1/14 H. P. Universal motor. Two speeds —10,000 and 22,500 R. P. M. Steel carrying case and accessory kit (2 wrenches; ⅛" chuck assembly; 1 belt; 3 mounted wheels) available.

Dumore "off-hand" grinders are often referred to as the handiest tools in the shop. Here a Dumore No. 10 is used to touch up a forming tool mounted in a punch press, thus saving set-up time and cutting costs.

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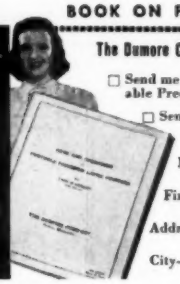

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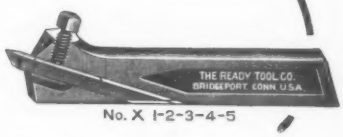

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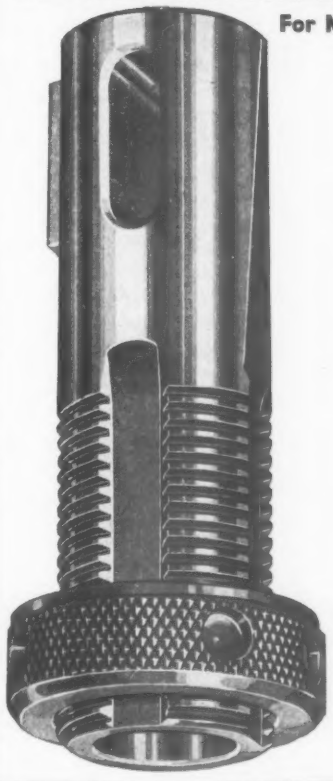

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evening November 7. The speaker of the evening was Mr. H. A. Frommelt, Director of Research and head of the Industrial Education Program for the Kearney & Trecker Corporation, of Milwaukee, Wisconsin, who spoke on the new technique in milling plastics moulds.

Mr. Frommelt described the many varieties of plastics in use at the present time and showed numerous slides illustrating their various physical and chemical properties. The slides were followed by several talking picture reels showing the new methods for making the dies used in processing plastics from raw material to finished product.

Preceding the speaker of the evening, Mr. Bob Ford, Chapter Chairman, called upon several committee men for their reports, and Mr. W. B. Peirce gave a very interesting account of the Toronto, Canada, meeting. Mr. Ford then read a brief autobiography of the life of Mr. Ford Lamb who has been the Executive Secretary of our Society until his recent death.

Racine

H. E. Linsley of Wright Aeronautical Corporation gave the Wisconsin preview of sound motion pictures depicting the manufacturing methods used to build the 14-cylinder, 1700 H.P. Wright Cyclone aircraft engine. Mr. Linsley pointed out special features and problems as the manufacturing steps from foundry operations to flight testing.

Over 200 men from the Racine, Milwaukee, Kenosha and Chicago chapters of A.S.T.E. attended the meeting which was preceded by a turkey dinner at Hotel Racine.

Mr. Eugene Bouton gave a report of the directors meeting held in Toronto, announcing the board had found it advisable to raise dues and thereby make the organization less dependent upon the industrial show which was formerly held annually but has been temporarily abandoned because of present conditions. It was also pointed out by Mr. Bouton that the membership was found to be rapidly growing and that with the opening of new chapters in the U. S. and Canada, was becoming international in scope. Because of the vigor with which Mr. Bouton spent part of the day feeding the bears at the Racine Zoo, he was presented with a box of lump sugar for his "bearishness."

After showing the pictures Mr. Linsley discussed particular problems encountered in building special machine tools from available standard units to meet their high production schedules. He also gave concrete examples of large savings in time and overhead as a result of their planning and designing special machines to do the work better and in a fraction of the time formerly required.

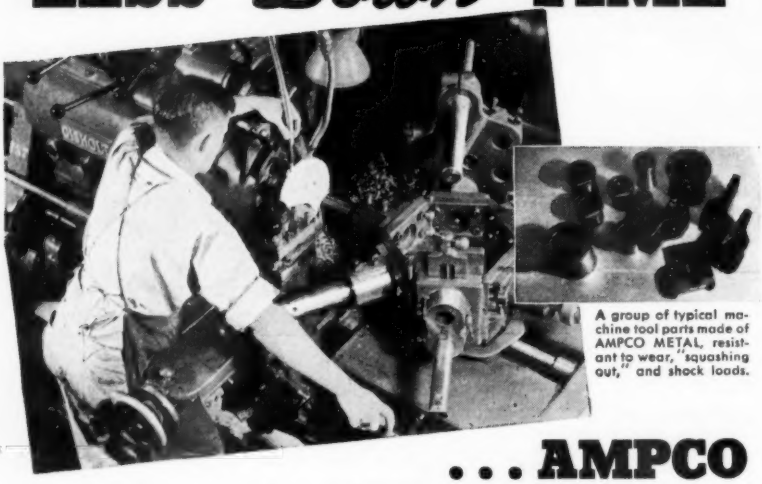
Rochester

Thirty odd members of Tool Engineers representing the Genesee Valley sat down at the Todd Union University of Rochester dinner table Wednesday evening, November 12. Their guest was Mr. H. A. Frommelt, Director of Industrail Research of Kearney & Trecker Corporation, Milwaukee, Wis.

The meeting proper was reinforced by more than 100 members and friends, making the attendance nearly 150 in all when seated in the Lower Strong Auditorium.

Chairman Lucas started the evening off by a surprise feature. Gus Burkhart, local representative of the Cleveland Twist Drill Company ran off a film entitled "Drills, Uses, and Abuses." For the experienced drill hand, it contained a great deal of old stuff. However, every drill hand as well as Tool Engineer can well afford to see this picture for it is the best gotten up film on tool instruction your correspondent has seen to date. Cleveland Twist Drill are to be

LESS "Down" TIME



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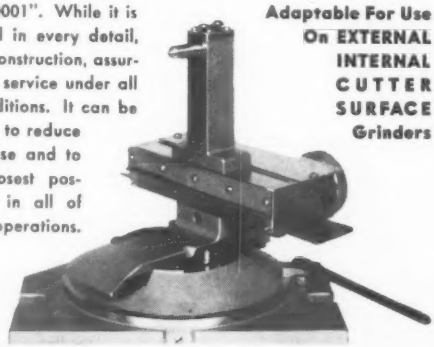

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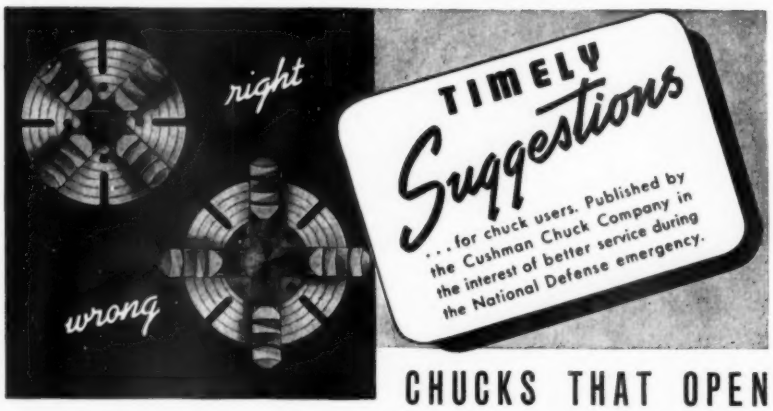
commended on this fine highly educational and interesting picture.

Mr. H. A. Frommelt went into the subject of plastics by briefly touching upon the history of this material. The fact that nitro-cellulose was introduced back in 1846 was surprising. Celluloid followed in about 1868, synthetic ivory, 1890, and then bakelite in 1909.

Plastics, Mr. Frommelt pointed out, have and continue to advance in respect to mechanical properties as well as varying uses by leaps and bounds. Though generally thought of as substitutes, particularly for "gadget" application, Mr. Frommelt laid particular emphasis upon the error in concluding that such applications were the limit of their use. He pointed out that bakelite has been and is being used in great abundance as a superior material in applications formerly thought of as limited to the metals. From the weight standpoint plastics have an approximate advantage over cast iron by being one-fifth as heavy. He pointed out that even with aluminum, its weight was twice that of the average plastic material. From the elasticity standpoint plastics have an advantage over most metals. Mr. Frommelt definitely went on record as stating plastics were superior in respect to tensile strength when considered on the weight basis.

New developments in plastic materials, particularly when derived from coffee at an estimated six cents per pound basis added to the many surprises in this fine talk.

Considerable time was spent in discussing mold methods, mold construction and the machining of the same. From a machine standpoint Mr. Frommelt gave a very fine description of the common methods employed in the making of molds for this class of work.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Suggestions
. . . for chuck users. Published by the Cushman Chuck Company in the interest of better service during the National Defense emergency.

CHUCKS THAT OPEN THEIR MOUTHS TOO WIDE . . . GET "BELL MOUTH"

Probably you have many new faces on your production line these days. It will do no harm, therefore, to restate some of the elementary principles of good chuck maintenance and practice. Chucks play such a vital role in the Defense Program that anything we or you can do to make them serve better and last longer is all to the good.

Experienced machinists know that chuck jaws are not intended to be operated beyond the periphery of the chuck body. Yet it is being done and it is causing good chucks to develop "bell mouth" and other inaccuracies due to strain. That means equipment out of service and unnecessary parts or replacement calls on an already overtaxed industry.

"Bell mouth" used to be a common chuck disease years ago. Cushman developed improvements in design, better cross sections, adopted finer material to give body ribs greater strength and rigidity. You will never know "bell mouth" if you insist on your Cushman Chucks being used properly within their rated capacity.

Cushman Engineers stand ready at all times to help you make most efficient use of your work-holding equipment. Write us.

CUSHMAN CHUCKS
A WORLD STANDARD FOR PRECISION

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THE CUSHMAN CHUCK CO.
HARTFORD, - - CONN.

Rockford

The Rockford Chapter held its meeting on November 6 at the Faust Hotel, Rockford. The Chapter celebrated the fourth annual aviation meeting in combination with fathers and sons' meeting. Mr. L. W. Reuland, Co-Chairman presiding.

Dinner was served at 6:30, during which time the members were entertained by Mr. Cliff Leatherby and son, Dick—a xylaphone and marimba combination. Also Vincent Acardo and Kenneth Kiltner, both 12 years old, entertained the members during dinner with accordions.

The dinner speaker was Mr. O. M. Spaid, Chairman of Rockford Citizens Committee. Mr. Spaid explained the present situation in regard to Rockford Public Schools' expenditures with several enlightening charts for comparison during past years.

The technical lecture of the evening took place before an audience of about 500. Mr. H. E. Linsley, Technical Advisor for Public Relations Division of Wright Aeronautical Corporation, Patterson, N. J., presented a five-reel talking motion picture entitled, "Power by Wright." This picture depicts in considerable detail the manufacturing processes involved in the production of a cyclone 14-cylinder radio air-cooled aircraft engine. All the members were greatly impressed by the thoroughness and precision used by Wright in the building of these engines.

The preliminary remarks made by Mr. Linsley preceding the moving picture brought to our attention the important job of tool engineering in making it possible for Wright Aeronautical to increase its production. In different parts of the picture were pointed out the use of special machine tools to replace several standard machine tools. Also the members were shown in the moving picture, the new Greenlee Multiple Station, Straight Line Automatic Transfer Machine which is installed at

The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS. AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR AND PRELOAD BEARINGS

STANDARD MORSE TAPER No. 2 TO 6 IN STOCK

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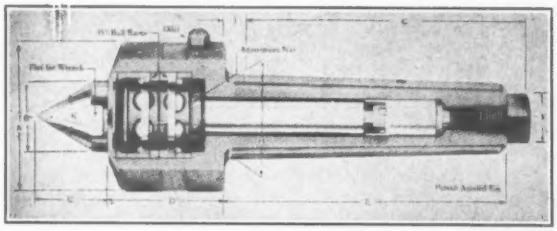

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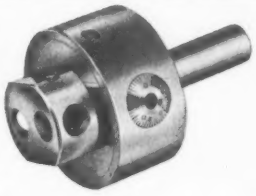

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PROMPT DELIVERIES

Fray Boring Heads have the exclusive Retainer Ring design—for full strength—complete safety—freedom from chips in micrometer mechanism.

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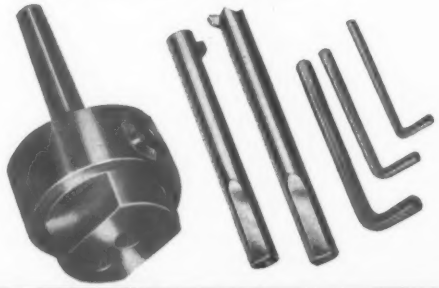
Makers of "All-Angle" Milling Machines and Milling Attachments



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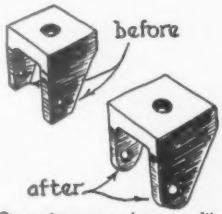
Locating surfaces on portable tool handle

Levels locating surfaces. No distortion or rocking in fixtures

Faces 12 bosses at one time, holding thickness to .005"



Generates arcs and curves without use of special radii and form cutters

Removing burr after drilling

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At last—***a belt grinder with machine tool accuracy.*** And one that provides new savings in time, labor and materials, such as no other machine tool can give. Hundreds of production-minded men, who saw demonstrations at the Metal Show, will confirm this statement.

This Porter-Cable Wet-Dry Belt Grinder offers a ***new*** process—***belt machining*** — that actually squares and faces within "fit" tolerances—trues up locating surfaces, finishes, cleans, burrs, removes gates, flashings and fins—releasing your millers, surfacers, shapers and lathes for other pressing production jobs.

By this modern machining method, you can do many operations free hand, at a big saving on fixtures and set-up time. With simple, inexpensive jigs you can hold dimensions within .0005". Works equally well on hard metals, or on brass, aluminum, magnesium alloy, lead, plastics or rubber. The wet belt will not load up, lasts longer, keeps cool enough to prevent melting, discoloring, warping.

FREE to Production-Minded Men

At the Metal Show, this new booklet, "Wet-Dry Belt Grinding in the Spotlight" was distributed to thousands interested in production. Did you get yours? If not, write today. It's FREE.

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Representatives in principal cities

the new Cincinnati Plant of Wright Aeronautical, in operation. This is a 56-station machine in which drilling, reaming, counter-boring, counter-sinking, spot facing, and tapping operations are performed on the aluminum cylinder head.

After the meeting, the members could examine the finished engine parts which were on display.

Golden Gate

The Golden Gate (San Francisco, Calif.) Chapter held its November Meeting at the Engineers' Club in San Francisco on Monday, November 10. Mr. Frank W. Curtis, Chief Engr. for the Van Norman Machine Tool Company and National President of A.S.T.E., was the guest speaker. He was introduced by Mr. Karl L. Bues, the Chapter Chairman. Mr. Curtis' talk on tooling was illustrated by slides and was of great interest to all the members. It was assured that many carried home plenty of food for thought on the ideas as presented by Mr. Curtis.

South Bend

South Bend Chapter held its November meeting on November 4. Over 300 were in attendance at the finest technical session in the history of the chapter. Chairman Horace R. Wentzell gave a few of the highlights of the Toronto semi-annual meeting, after which the chairman called on Mr. Otto W. Winter 1st Vice President of A.S.T.E. to pay tribute to Ford Lamb our National Executive Secretary, who passed away Oct. 26. Chairman Wentzell then started the ball rolling for the technical session by calling on Geo. F. Weber, Vocational Director of the South Bend Schools, who outlined in a fine manner defense training efforts in South Bend city schools. Many of our members are actively working in cooperation with the agencies in this undertaking. Next was Otto W. Winter who gave us the activities of the A.S.T.E. along the same lines, from Mr. Winter's report we can see that great things are being done along this line in our organization. Mr. Horace E. Linsley, technical advisor of public relations dept. of the Wright Aeronautical Corp. was the speaker of the evening. After a brief introductory talk on the Tool Engineer in the airplane motor manufacture, Mr. Linsley presented a talking picture depicting the process of Mfg. Wright 9 & 14 cylinder engines.

Springfield

The Springfield Chapter held its executives' Night at the Highland Hotel, Springfield, Mass., on Monday, November 10. This was one of the most successful meetings ever put on by the Springfield Chapter. More than 350 members and guests sat down to dinner in the Roman Room at the hotel.

Practically every company in this area at all identified with defense work was represented at the meeting. Seated at the head table were Herbert Smith, President of the Treadwell Corporation; Howard Miller, New England Sales Manager of the Gilbert & Barker Company; William Lippman, Manager of the East Springfield Plant, Westinghouse Electric and Mfg. Company; Charles Van Norman, Chairman of the Board of the Van Norman Machine Tool Company; Philip Bills, Vice President and Treasurer of Gilbert & Barker Company; Mr. Brennan; Mr. A. H. d'Arcambal; James Y. Scott, President of the Van Norman Machine Tool Company; Terrence O'Donnell, Works Mgr. of Gilbert & Barker; Col. Ford, Works Mgr. of the Springfield Armory; Irwin F. Holland, Regional Director of the A.S.T.E.; John Lindegren, Regional Director of the A.S.T.E.; Henry Moore, Chairman of the Hartford Chapter, A.S.T.E.; Frederick Van Norman, Vice President of the Van Norman Machine

CONSERVE YOUR HIGH SPEED CUTTING TOOLS

By Increasing Tool Life!

STOP WASTEFUL HAND GRINDING:

Investigate the OLIVER LINE of Tool Reconditioning Machines; get the most out of your Cutting Tools, thru increased output between grinds and less wastage in the GRINDING OPERATION.

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Oliver Methods are controlled, they are uniform—results always the same—they assure maximum output from the Production machines, less grinding time, faster grinding, and your tools WILL LAST LONGER.

It pays to conserve those **scarce** High Speed Cutting Tools.

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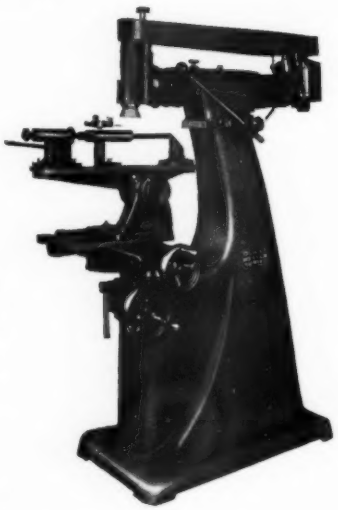

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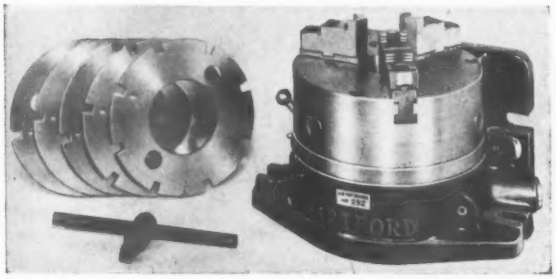
Super Spacer



OK for Unskilled Operators

Yes sir, Mr. Tool Engineer, this flexible reliable speedy indexing fixture is so positive that even unskilled operators can use it on production work. Because it *is* so accurate—even under heavy cuts, your unskilled operators can use in milling and drilling machines, slotters and planers—at faster speeds and feeds. Ideal for the tool room—no modern shop should be without this excellent tool.

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THE HARTFORD SPECIAL MACHINERY CO.
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One of a battery of C-F Welding Positioners on the production line at the Manitowoc Ship Building Co., Manitowoc, Wisc.

★ All over the country, C-F Welding Positioners are serving industry and the nation in speeding up the welding process on defense material from armaments to warships. Not only do these modern machines save time, but they permit better, "down-hand" welding on every job and, as their main purpose is to save handling, C-F Positioners mean definite production economy.

The complete story is in our circular WP-20. Write for it today.

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WOODY SPENCER SAYS:

"The right play at the right time won a championship."

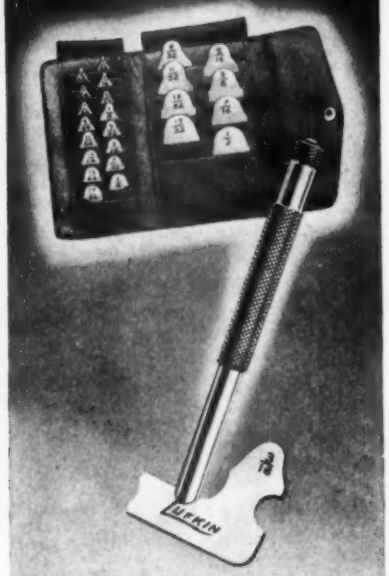
The final game in the American League Championship series between the Hershey Bears and Cleveland's Barons entered the overtime period on a tie score, 2-2. At 1:25 the Baron Bartholome streaked down the side of the rink to catch a pass from Jake Milford and Don Deacon. From 20 feet out, Bartholome drove the puck past the Hershey goalie and into the net. The game ended —the Barons had won. The right play at the right time had turned the trick.

You may be able to "turn a trick" in your production by checking the taps you are using. Are they the right type for the job to be done? If you have the slightest doubt —call in our engineers to help you. Wood & Spencer engineers are available without obligation to manufacturers. Write us today, explaining briefly your situation. The Wood & Spencer Co., 1918 E. 61st St., Cleveland, Ohio.

"The Right Tap at the Right Time"

The WOOD & SPENCER CO.
Cleveland, Ohio

LUFKIN
RADIUS GAGES



EASY TO USE
5 APPLICATIONS

Because each blade in the Lufkin set of Radius Gages is a separate unit, it is more easily and accurately applied to the work. No other parts of the set can cause interference. Each blade has five applications for its individual radius and carries the corresponding external and internal forms. An attractive, durable leatherette folder is supplied with each set to not only protect the gages, but to make the selection of them simple and easy. And for hard-to-get-at places, use the Lufkin Gage Holder which is furnished at a slight additional cost.

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TAPES · RULES · PRECISION TOOLS

Tool Company; Edward Moll, Vice President of the American Bosch Company; and Raymond H. Morris, National Second Vice President of A.S.T.E.

Frank W. Curtis, National President of the A.S.T.E., who is production engineer of the Van Norman Company, was unable to be present because of business which took him to California.

A. H. d'Arcambal acted as toastmaster and introduced the guests at the head table, most of whom spoke briefly on various subjects. He then introduced Mr. Ralph Flanders, President of Jones & Lamson Machine Company, President of the New England Council, and affiliated with many other civic organizations, who gave a most interesting talk on the Tool Engineer's place in industry. Mr. Flanders spoke for about an hour, and his subject was so completely covered that when questions were asked for at the end of his speech, none were forthcoming. Mr. Flanders had a real message for Tool Engineers and his talk should serve as an inspiration for all those present.

During the dinner, a group of artists from Springfield furnished music and entertainment. Some fine contributions, in the way of songs, were also made by members of the Chapter and guests.

Twin States—Springfield, Vt.

The Twin States Chapter held its meeting on November 12 at the Masonic Temple. The program opened with dinner served at 6:30 p.m. by ladies of the Ramona Chapter of the Eastern Star. Approximately 75 members were present from Windsor, Claremont, N. H., and Springfield.

Wilbur Handy presided, and a short business meeting was held, after which Mr. Ellis, Consulting Engr. of the Heald Machine Company of Worcester, Mass., was introduced as the speaker of the evening. His topic was "Precision Boring Machines."

Mr. Ellis gave an interesting talk on the boring machines produced by his company, which are now being used in defense industries. Mr. Ellis illustrated his talk with a number of lantern slides and also showed a number of samples, principally airplane pump parts. After his talk, Mr. Ellis answered questions from the members for about an hour, which is indicative of the interest shown by the members in his subject.

Syracuse

The Syracuse Tool Engineers assembled for their monthly meeting on November 11, at Deauville on Owasco Lake, Auburn, N. Y. The appetite of the members was whetted by a little delay in starting the meeting which consequently

RUTHMAN
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COOLANT PUMPS

SHOW US
your coolant problem . . .
WE'LL SHOW YOU
a pump to solve it!

There's a Gusher model for your needs to speed your work. Write!

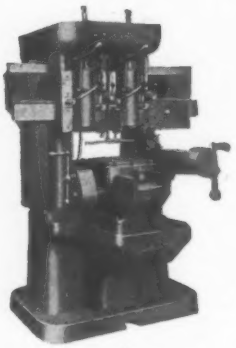
P3 models are available in immersed type (1-P3), flange-mounted with internal discharge (2-P3), flange-mounted with external right hand discharge (3-P3), left hand discharge (4-P3). All above are available in short and long models, that is, for two maximum high water lines.

Model P3

Pat. and Pats. Pending

THE RUTHMAN MACHINERY CO.
1815 READING ROAD, CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

MOREY No. 12M High Speed
Vertical PROFILER MILLER
Preloaded Precision Bearings Throughout



Production of interchangeable parts requiring milling of any contour or outline can be materially speeded up by this Profiling and Milling Machine.

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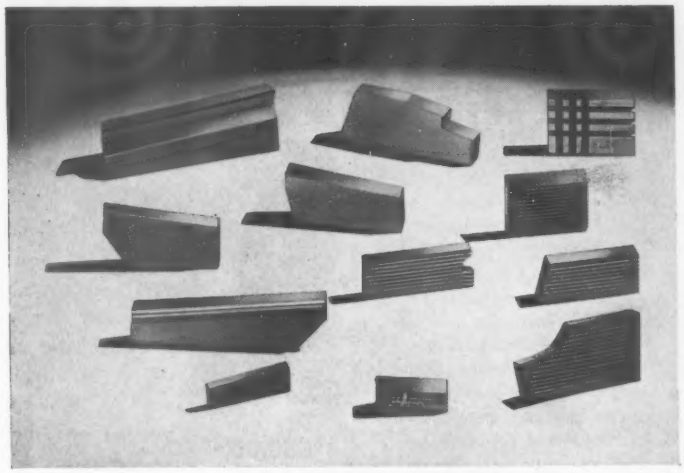
Replace with CROBALT . . . Increase Production



SPECIAL CROBALT BORING AND REAMING BLADES

CROBALT replaces High Speed Steel where greater abrasion resistance and high cutting speed are required. Its hardness at high temperature makes it possible to cut at speeds which quickly soften and destroy heat treated tools.

Crobalt replaces Cemented Carbides when tool failure is caused by chipping and breakage. It has been developed to have greater resistance to impact and freedom from chipping.

Crobalt involves no special problem in its use—either in cutting or grinding. It requires no change in your present equipment.

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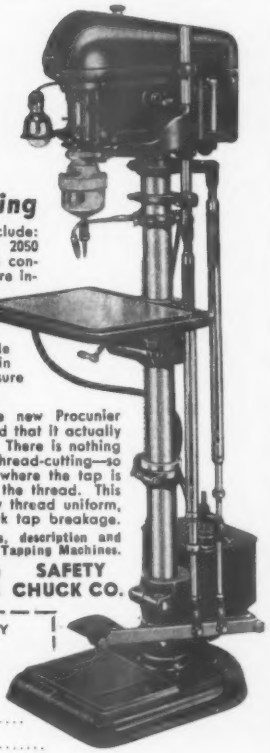
CROBALT INC., ANN ARBOR, MICH.

Revolutionary New Tapping Machines



. . . give you Faster more Accurate Tapping

The features that make this possible include: 1. Four Speeds, ranging from 390 to 2050 R.P.M., efficiently handle jobs for which conventional high speed tapping machines are inadequate. 2. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads. 3. Extra long Spiral Compensating Springs conveniently located, with wide range hand-screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF OPERATOR.

Tap Establishes Its Own Lead The new Procunier Universal Tapping Machine is so designed that it actually allows the tap to establish its own lead. There is nothing more accurate than the tap itself in thread-cutting—so maximum tapping efficiency is attained where the tap is free to establish its own lead in cutting the thread. This means more accurate tapping with every thread uniform, greater production with less spoiled work tap breakage.

SEND FOR BULLETIN giving full details, description and prices on the full line of Procunier Universal Tapping Machines.

PROCUNIER SAFETY CHUCK CO.

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Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.

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Douglas PRECISION SLOTTER

FOR TOOLROOM AND PRODUCTION

Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.

Prompt Delivery by Large-Scale Production

Built with 7", 8", 10" Stroke

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BALL BEARING GRINDERS
for accurately sharpening
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BALDOR CARBIDE TOOL GRINDER is precision-built for accurately and quickly sharpening Carbide Tools. Sturdy ⅓ H.P. heavy duty, ball-bearing, reversible Motor. Large adjustable tool-rest tables. Satisfaction guaranteed.
NEW LOW PRICE $95.00
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BALDOR ELECTRIC COMPANY
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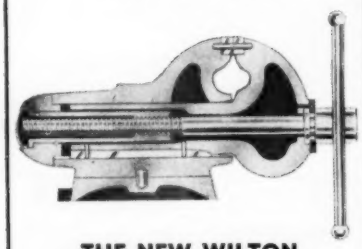
BUILT BY MOTOR SPECIALISTS

"MODERN DESIGN"

THE NEW WILTON PRECISION SCREW VISE
Entirely NEW construction and design to give YOU every essential feature—
Great Strength and Holding POWER—
Precision spindle, Eccentrically guided
Securely enclosed spindle and nut
No dead motion, no side twist
Guaranteed One Year
Write for complete details and prices
WILTON TOOL CORPORATION
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provided the occasion for the celebration and toasts in honor of Armistice Day.

A brief business meeting followed the dinner. Respectful recognition was accorded the heroes of 1917-18 in consideration of Armistice Day. The Chapter also passed resolutions of respect for Ford R. Lamb whose passing was a shock to his friends in the Chapter.

Mr. Wm. H. Oldacre of the D. A. Stuart Oil Company addressed the group on the subject "Lubrication as a Factor In Tool Design". Mr. Oldacre is Vice President in charge of research and engineering and has been connected with investigations of the S.A.E. and other technical organizations on lubricating problems. The talk given by Mr. Oldacre pointed out the economies and increased production resulting from the use of proper lubricants. Slides of photomicrographs and charts were shown to help explain the thorough study which Mr. Oldacre has made of chip formation. He showed how the type of chip plus consideration of the materials to be cut and the nature of the cutting operation influence the selection of a suitable cutting compound. An informal discussion period followed the close of the talk.

Our Auburn members were present in considerable number. These members cheerfully attend the meetings usually held in Syracuse, but sometimes are unable to be present on account of pressure of work and inconvenience of travel from Auburn to Syracuse during the winter months. The Chapter acknowledges the contribution of John Moffitt and his assistant, Miss Harding, in furnishing entertainment at the meeting.

Handy Andy Says

(Continued from page 114)

Okay; she's the real McCoy and Connie can be proud of his daughter. Vic Ericson of Norton Company (Worcester) wrote a very encouraging letter—and thanks for the compliments. Also heard from Ray Morris, whose Vice Presidency quite vindicates the judgment of the Directors who elected him to office. Otto Winter implies that he is still digesting my previous (longhand) letter and will write further when he has deciphered it; in the meanwhile, he is busy with the Defense Training Program. Frank Curtis is flying hither and yon, chartering New Chapters and setting a record for the next Prex, and Frank Crone and Clyde Hause are quietly plugging away at the Home Office.

T. H. L. FRONT LEVER
BENCH PUNCH

Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.
Capacity ½" hole through 7/16" steel; 13/32" through ¼" steel. Can also be made for holes up to ⅞" in thinner metal. Stock punches and dies available from 7/16" to ½" by 64ths.
PRICE WITH ONE PUNCH AND ONE DIE—
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Immediate Shipment
Weight, 70 lbs.
T. H. LEWTHWAITE MACHINE CO.
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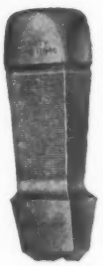
HOW MUCH IS "SAFETY" WORTH TO YOU?
"Keep your plant in production 24 hours a day."
To meet this demand of the National Defense Program it is necessary that you take every precaution to prevent accidents to your workers.

SAFETY WEDGE GRIP
SAFETY WEDGE GRIP STAMPS are constructed to give the maximum of Safety and Service on any stamping job. For a small additional cost it is possible to purchase these stamps, which will NOT Spall or Mushroom and assure at least 50% to 100% more safety on your stamping operation.
Wedge Grip design furnished in letters and figures, special line stamps, symbols, and Steel Type Holders.
M. E. CUNNINGHAM CO.
169 E. Carson St. Pittsburgh, Pa.

LAPPING ECONOMY

Boyar-Schultz COPPER HEAD LAPS

They save time in both tool room and in production. Lapping action is rapid; adjustable copper sleeves are the only wearing part and are quickly replaceable.

BOYAR-SCHULTZ CORPORATION
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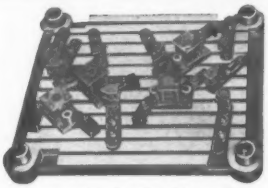
HERE'S YOUR COMPLETE NEWS BULLETIN ON THIS UNIQUE NEW MACHINE

Just off the press is an 8-page publication giving full, illustrated information on this entirely new type of surface grinder for small tools and parts. Shown and described are the tilting wheelhead which permits angle and shoulder grinding, the hardened ways and ball mountings, and other exclusive features which assure you of the ultimate in precision, with higher output and less effort on the part of your operators. A line on your letter-head will bring you a copy of this new bulletin.

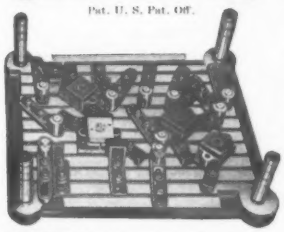
The TAFT-PEIRCE MANUFACTURING CO., WOONSOCKET, R. I.

WHISTLER
Adjustable Perforating Dies
CAN BE CHANGED AT WILL WITHOUT ADDITIONAL DIE EXPENSE

OPERATES LIKE ANY SINGLE PURPOSE DIE



Pat. U. S. Pat. Off.



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Increase Production by saving days and weeks of single purpose die making. Whistler Adjustable Dies are ready to set up for *immediate production — absolutely accurate on short or long runs.*

Punches and Dies from stock —1/32" to 1 1/2". Larger sizes on order. Minimum perforating centers of 7/8". Self cleaning. In use by country's largest manufacturers.

FREE Handy catalog, illustrating and explaining Whistler Adjustable Perforating Dies and other Whistler dies, tools and special machinery, yours on request.

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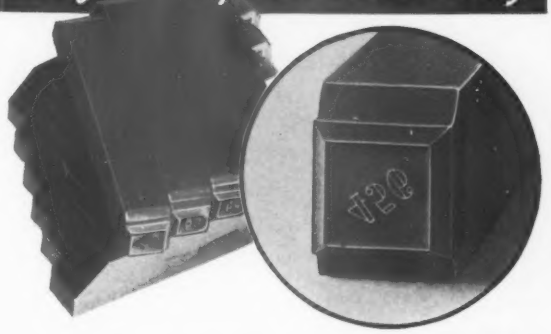
... for Inspection Marking



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Extra deep . . . sharp face . . . acid resisting rubber stamps are supplied with one or more letters, figures, symbols or special designs . . . for all types of inspection and code marking of metal parts or products. Impressions are neat and legible, on steel, bronze, brass or other metals. Supplied with solid or open face characters or design. Write for full information and prices.

JAS. H. MATTHEWS & CO.
3945 FORBES ST. ∴ PITTSBURGH, PA.
New York—Chicago—Phila.—Boston—Detroit—Newark—Syracuse
DISTRICT SALES OFFICES - CLEVELAND - HARTFORD - BIRMINGHAM

THE PASSING PARADE . . . .

Promotions . . . Personals . . . Deaths . . .

Three promotions in the executive staff of Pratt & Whitney, Division Niles-Bement-Pond Company of West Hartford, Connecticut have just been announced by Clayton R. Burt, President and General Manager.

H. D. Tanner, Vice-president and Manager of the Machinery Division, was made Vice-president and Assistant General Manager: A. H. d'Arcambal, Sales Manager of the Small Tool and Gage Divisions, and Consulting Metallurgist, was elected a Vice-president, and William P. Kirk, Sales Manager of the Machinery Department, was named a Vice-president. Both Mr. d'Arcambal and Mr. Kirk retain their previous duties.

Mr. Tanner, who joined Pratt & Whitney in 1920 as an engineer, was born in Pawtucket, R. I. in 1889, and was educated in mechanical engineering at Brown University, later studying at the Rhode Island School of Design. He was with Brown & Sharpe in Providence for eight years as a design engineer, and is a member of the American Society of Mechanical Engineers; the Society of Automotive Engineers, and the American Gear Manufacturers' Association.

Mr. d'Arcambal, active in promotion of research in industry, was born in Kalamazoo, Michigan, in 1890, and following graduation from the engineering department of the University of Michigan, was for five years connected with various automotive concerns in the Detroit district. For two years before joining Pratt & Whitney in 1919, he was with Wright-Martin Aircraft as chief metallurgist.

P. & W.'s d'Arcambal
Promoted to Vice President.

Active in various technical societies, he is a past president of the American Society of Metals, the American Society for Steel Treating, and the American Society of Tool Engineers. He is a member of the Society of Automotive Engineers, and the Hartford Engineers Club.

Mr. Kirk was graduated in engineering from Columbia University in 1907 and has been with Pratt & Whitney since then, first in the shop for two years, and later in the sales department. In the middle west from 1909 until 1924, he opened the Cincinnati branch office in 1912,

1921
1911
1931
MIDWEST CUTTERS and
MIDWEST EXPERIENCE
Help Step Up Your
NATIONAL DEFENSE WORK
1941
New Metal Cutting Problems come up faster than ever during an emergency. They must be solved quickly and accurately with proper Metal Cutting Tools correctly applied.
Midwest offers the experience of 30 years in the design, manufacture and application of Precision Metal Cutting Tools to the industries and men who have the job of turning out important products for our National Defense quickly, accurately and efficiently.
Write for assistance or information you need and ask for Midwest's Catalog No. 17 —full of valuable tool data.
MIDWEST TOOL & MFG. CO.
WEST JEFFERSON AVE. • DETROIT, MICH.
Precision METAL CUTTING TOOLS
END MILLS • SLEEVES • COUNTERBORES • DRILLS • SPECIAL TOOLS
REAMERS • MILLING CUTTERS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

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BARNES
HYDRAULICS

• You buy more than equipment — you buy an engineered application. Designed and built for the job to be done.

As designers and builders of hydraulic units, panels, control valves, and pumps for manufacturers in a wide range of industries, we are in excellent position to solve your hydraulic problems and supply the necessary equipment.

And what's more — users of Barnes Hydraulics over a period of many years under most severe operating conditions report maintenance costs at an absolute minimum—lowest by comparison.

That's why careful buyers specify

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Send us your inquiries with information about the job to be done. We'll be glad to submit a proposal or if you say so, we will have an engineer call.

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AND FACTORY
ROCKFORD, ILL.

Reclinable
POWER PRESSES

This press has long been considered the most suitable and favored type for general stamping work. Its features have been standard for a number of years, but many important improvements in details make the latest model outstanding. Its high performance is the result of thorough research, sound engineering and careful designing.

The Type 36 Press is available either plain or back geared, and the models range from 4 to 100 tons capacity.

Complete information on this and other Z & H presses will be sent on request.

ZEH & HAHNEMANN CO.
192 VANDERPOOL STREET, NEWARK, N. J.

FOR MODERN
METAL CUTTING TOOLS
Specify
NATIONAL

NATIONAL TWIST DRILL & TOOL CO., Detroit, U.S.A.

TWIST DRILLS • REAMERS • HOBS • MILLING CUTTERS • COUNTERBORES • SPECIAL TOOLS

Tap and Die Division WINTER BROTHERS CO., Wrentham, Mass.

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DIAMONDS for Defense

BIG-HED "Loc-Key-Set" Nibs are now in stock at our local service and stock branch. Loc-Key-Set construction now used in all D.T.Co. Diamond Dressing Tools. Call or write for details.

Pat. Pend.

BIG-HED "Loc-Key-Set" (Pat. Pend.) Nibs always provide better dressing and truer, sharper wheels because they dress cooler, permit closer tolerances. Diamond cannot shift and slug will not slip because new Loc-Key-Set feature locks diamond-holding slug to Nib with unique internal key construction, permitting micrometer control of tool pass.

DIAMOND TOOL COMPANY, Nol Inc.
938 E. 41st Street CHICAGO, ILL.

All The Parts Must Fit

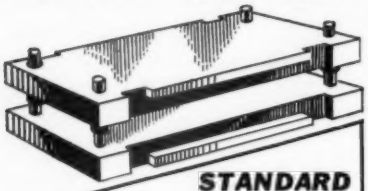
Speeding up -
the production line is a long way from enough!

Parts coming -
from all sections of the factory; all corners of the nation -- must be made to a "standard."

Be sure -- with
Chrome Plated Gage Blocks

DEARBORN GAGE COMPANY
"Originators of Chromium Plated Gage Blocks"
22037 BEECH STREET DEARBORN, MICH.

DANLY
ALL-STEEL DIE SETS



STANDARD
OR SPECIAL,
ANY SIZE, ANY SHAPE
DEPENDABLE QUALITY,
FAST DELIVERY

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue, Chicago, Illinois
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
DUCOMMUN METALS & SUPPLY CO.
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DANLY PRECISION
DIE SETS
AND DIE MAKERS' SUPPLIES

BETTER BORES FOR BALL BEARINGS MADE WITH COGSDILL Expanding Bearingizer

Fast Accurate Adjustable for various tolerances, materials, and to correct for wear.

Improves the fit, precision and life of ball and roller bearings.

Send drawing for recommendations

HOLE ENGINEERING SERVICE
5901 FOURTH AVE. DETROIT, MICH.

—PASSING PARADE—

Joseph T. Wright of Port Washington, N. Y. has been named assistant works manager of the Worthington Pump & Machinery Corp., Holyoke, Mass.

Mr. Wright, a veteran of the machinery and tool business will assist Harry A. Feldbush, vice president and works manager of the Holyoke Works in all phases of Worthington production, exclusive of the government contracts for gun mounts.

N. A. Woodworth, president of the Suprex Gage Company of Pleasant Ridge, Detroit, Michigan, announces the appointment of Marvin W. Davis as Sales Manager.

Davis has been actively associated in the standardization, manufacture, and sale of metal working gages for the past 23 years.

Eugene Bouton, supervisor of production standards at the J. I. Case tractor plant in Racine, Wisconsin since 1928, recently resigned to join the Milwaukee staff of the Office of Production Management. He will visit manufacturing plants, check up on their equipment, capacity and ability to work on defense contracts and assist in getting them contracts.

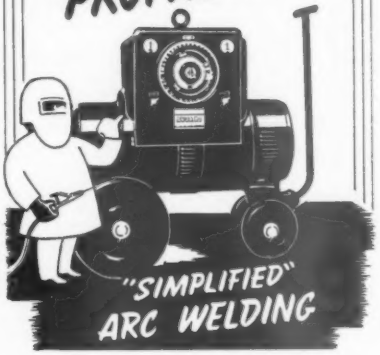
OPM'S Bouton
He will assist in placing contracts.

Cliff Bendle, sales engineer with Crobalt Inc. since its establishment in 1932, has been appointed sales manager. His headquarters will be at the new Crobalt plant in Ann Arbor, Michigan.

At a meeting of the Board of Directors, Harry Wilson, Jr., Works Manager of the Jessop Steel Company, Washington, Pa., was made Vice President in Charge of Operations, according to an announcement by the company.

C. A. (Charlie) Heil, widely known District Sales Manager for The Carpenter Steel Company, at Cleveland, Ohio, has announced his retirement effective

SAVE TIME... INCREASE PROFITS with...



• Delays are unnecessary when Hobart Arc Welders are on the job . . . they're ruggedly built to withstand hours and hours of continuous welding. Production speeds up; profits increase. Exclusive Hobart features cut labor costs and guarantee highest quality welds. Ease of operation and lower current costs make Hobart your logical arc welder buy. Write for details.

★ This Valuable Book FREE . . .
Tells how to apply arc welding to hundreds of new jobs. Write for it.

Hobart Bros. BOX. TE. 121 TROY, OHIO
one of the world's Largest Builders of Arc welders

SCHAUER IDEAL Speed Lathes

• VARIABLE SPEED

IDEAL Variable Speed Lathes with infinite selection of spindle speeds—ratio 6½ to 1 with single speed and 13 to 1 with 2 speed motor; ranges from 65 to 4200 RPM. Foot treadle controls collet, brake and spindle.

• for FAST PRODUCTION

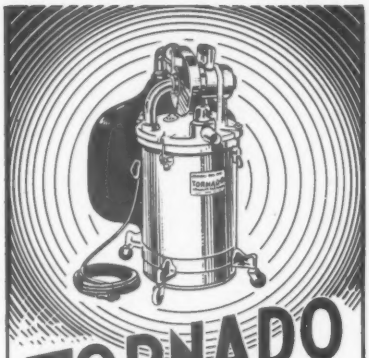
. . . of identical work in large quantities, this IDEAL Speed Lathe is particularly adapted, for burring, polishing and tapping of gears, pulleys, dies, etc. Single or two speed, built-in, fan-cooled motor; exclusive, automatic brake; spring type collet, also obtained with 3-jaw Universal chuck.

• with ADJUSTABLE CHUCK

. . . for different size work, this IDEAL Speed Lathe is used for polishing, burring and lapping operations. Other lathes with spring type collets, step chucks and expanding mandrels.

Write today for Catalog.

SCHAUER MACHINE CO.
2066-68 Reading Rd., Cincinnati, O.



TORNADO

PORTABLE INDUSTRIAL VACUUM CLEANER

reduces

DUST DANGER

QUICKLY cleans walls, floors, line shafting, pipes, overhead beams, etc. Reduces health and fire hazards. Improves working conditions and morale. Cuts waste. Salvages valuable scrap. Increases efficiency.

A real one-man unit. Weighs only 40 lbs. 1 H.P. universal motor. 49" waterlift, 175 c.f.m. Removes dust, chips, lint, etc. Does a thorough cleaning job. Attachments for cleaning everything.

Convertible into Blower for blowing dust and dirt out of motors, generators and hard-to-reach places. Adaptable for spraying paint and insecticides.

FREE TRIAL—WRITE TO

BREUER ELECTRIC MFG. CO.
5124 N. Ravenswood Ave., Chicago

TAKE THE DUST OUT OF DUST

TORNADO

AIRCRAFT RIVET HOLES BY THE MILLIONS ARE BEING PUNCHED WITH WALES PATENTED SELF CONTAINED DIES

Photo shows part of a shipment to one of our customers.

AT
BELL
BOEING
BREWSTER
CONSOLIDATED
CURTISS-WRIGHT
DOUGLAS
LOCKHEED
McDONNELL
MURRAY
NORTHROP
REPUBLIC
ROHR
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THERE MUST BE A REASON!

FOR FURTHER INFORMATION WRITE

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IMMEDIATE DELIVERY

AUTOMATICS

Cleveland, 1¼ to 2" Model A
Cleveland, ⅞ & 1¼" Model B
Cleveland, 4½" Model M, Chucker, M.D.
2¼, 3¼ and 4¼" Gridley single spindle
No. 22 New Britain

DRILLS

Cincinnati Bickford 21" Direct Drive, M.D.
No. 1A Edlund H.S.B.B., 4 Spdl., Power Feed, M. D.
Assorted High Speed & Sliding Head
Morris, 4' Radial, M.D.

GRINDERS

Brown & Sharpe No. 2 & 3 Universal
10" x 36" Landis, Self Contained
16" x 66" Landis Plain
Norton, 10 x 24 & 36" Plain
Norton, 18 x 96" with 30" Gap.
Lapper, No. 15 Norton M.D.

LATHES

Hendey Yoke Head, 14 x 5 and 18 x 10'
24" x 10' Schumacher-Boye, Quick Change, C/S
8" Sundstrand Stub Lathe, M.D.

MILLING MACHINES

No. 4 B & Model B. Becker Vertical
Brown & Sharpe No. 2 Universal, Cone

PRESSES

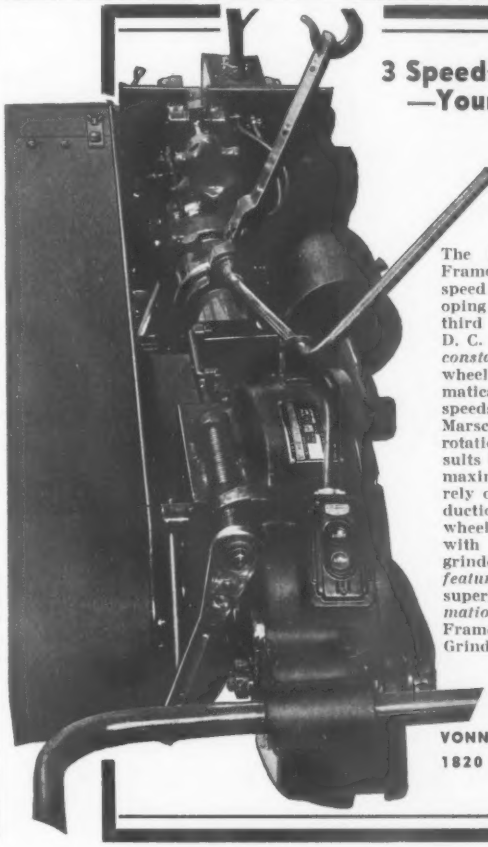
No. 34 Toledo Solid Back, Geared
No. 2, 3, 4 Farracute Solid Back
No. 68 N Bliss, Dble. Action, Cam

Planers, Shapers, Shears, Etc.

MACHINE TOOLS — POWER PRESSES

OTT MACHINERY SALES INC.

546 Second Ave. Detroit, Mich.



3 Speeds—Extra Efficiency —Yours in this Marschke

SWING FRAME GRINDER

The MARSCHKE A. C. Swing Frame Grinder shown here has speed control — 3 *speeds* — developing correct s.f.p.m. during each third of wheel life ● Marschke D. C. Swing Frame Grinders give *constant* cutting speed. Adjusting wheel guard to wheel wear automatically takes care of wheel speeds ● Speed control, added to Marschke's vibrationless wheel rotation and easy handling, results in steady wheel contact and maximum cutting. Operators can rely on Marschkes for more production. You can expect less wheel and machine expense than with any other swing frame grinder. ● Look into the 18 *features* accounting for Marschke superiority. *Write for full information* about Marschke Swing Frame, Floor Stand and Pedestal Grinders.

THE MARSCHKE LINE

VONNEGUT MOULDER CORPORATION
1820 Madison, Indianapolis, Indiana

A LaSalle Design

Tool Designing
Machine Designing
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LA SALLE DESIGNING CO.
628 W. LAKE ST.
CHICAGO, ILLINOIS
Monroe 2345

DO YOU KNOW How Many MODERN COLLET PRODUCTS Are Furnished As STANDARD?

Modern Collet can supply **any** replacement part or tool required for a screw machine. Such items as Tool Holders, Twin Disc Clutches and Cross-Slide Drums are typical of those which can be furnished in addition to the more familiar lines of collets, feed fingers, etc.

For complete information on various products or our machine rebuilding service, write for our complete catalog or get in touch with your nearest Modern Collet representative.

MODERN COLLET and MACHINE CO.
407 Salliotte St. • Ecorse, Mich.

—PASSING PARADE—

November 1st. Mr. Heil has completed 32 years of active service with the company in the Cleveland territory, and for the past 26 years held the position of District Sales Manager.

L. E. Osborne, formerly manager of manufacturing and engineering of the Westinghouse Merchandising Division, has been appointed assistant to the president in charge of the Company's national defense subcontracting program. George H. Bucher, President of the Westinghouse Electric & Manufacturing Company, announced.

Robert M. Kalb, who for thirteen years was research engineer of the Bell Telephone Laboratory of New York, has just been appointed Assistant Chief Engineer of the Kellogg Switchboard & Supply Company of Chicago.

Mr. Wallace F. Ardussi has been placed in charge of Research and Product Development for Foote Bros. Gear &

Foote Bros.' Ardussi
He was put in charge of research.

Machine Corporation, it was announced recently by W. A. Barr, President and General Manager.

Robert M. Gibson has been transferred from Koppers Company, Bartlett Hayward Division, to Koppers Company, American Hammered Piston Ring Division, Baltimore, as Engineer. He is engaged in design and construction to greatly increase the facilities there.

Appointment of Francis E. Simmons, as industrial economic adviser in charge of textile research was announced today by Stacy May, Chief of the Bureau of Research and Statistics.

Charles Klaus, a machinist, recently began his 44th year with the Westinghouse Electric and Manufacturing Company. During these years he has helped to build equipment for America during three national defense emergencies.

If Christmas,
and all that it stands for,
is going to continue
to mean anything to us,
we must successfully complete
the defense job now in hand.

Each one of us
is personally responsible.

NATIONAL TOOL SALVAGE CO.
3816 Beaubien St.
Detroit, Mich.

HIGH SPEED TAPS

NOW ON CRITICAL LIST. KEEP THOSE NOW IN SERVICE 100% EFFICIENT BY PROPER SHARPENING.

THIS NO. 12 GRAND RAPIDS TAP GRINDER MAKES THE JOB A SIMPLE ONE.

Bulletin on request

GALLMEYER & LIVINGSTON CO.
110 Straight Ave., SW
GRAND RAPIDS MICHIGAN

Mr. Fay Aller has been named Director of Research, and Mr. Albert Wartinger has been appointed Chief Engineer of the Sheffield Corporation, Dayton, Ohio.

Sheffield's Wartinger
Eighteen years to Chief Engineer.

Mr. Aller was Chief Engineer of the Gage & Machine Tool Division and has been with the company for eight years. Mr. Wartinger was Chief Engineer of the Tool & Die Division. He has been with Sheffield for fifteen years.

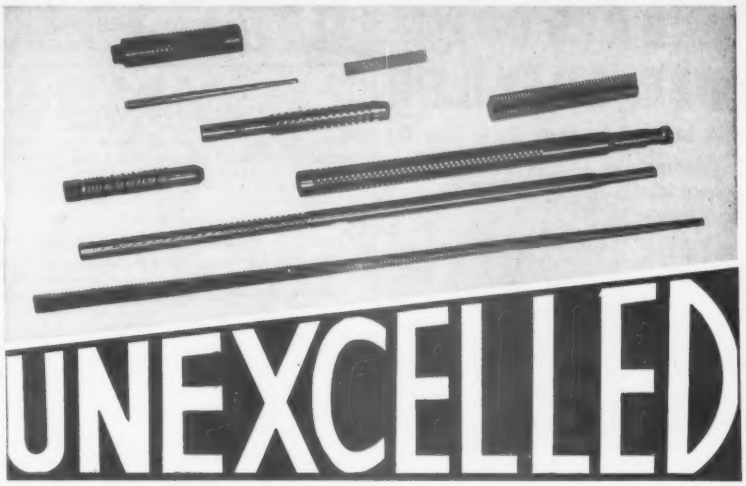
Died

George H. Gibb, 63, superintendent of manufacturing of the Gilbert & Barker Manufacturing Co., West Springfield, Mass. died recently at his home in Longmeadow, Mass.

Coming to the United States from Scotland in 1910 he entered the employ of the Chapman Valve Co. as foreman of the toolroom and machine shop. He joined Gilbert & Barker in 1914 as a foreman.

William O. Thewes, superintendent of the Ridge Tool Co., died suddenly the morning of Nov. 19 at his home in Lakewood, Cleveland suburb. Mr. Thewes, inventor of certain types of pipe wrenches and other tools, was one of the founders of the Ridge Tool Co. at North Ridgeville, Ohio, 20 years ago. It began under his supervision as a small shop employing 10 men and expanded to a plant employing over 200. Born in Cleveland 58 years ago, Mr. Thewes spent his life in that city. He had been in good health until the time of his death and worked at the tool company plant the day preceding his death.

Paul F. Reichhelm, President of the American Swiss File & Tool Co. of Elizabeth, N. J., died on Octotber 3, 1941, after a long illness. Mr. Reichhelm had been associated with the company ever since it was founded by his father, Mr. E. P. Reichhelm, in 1900, and succeeded his father as president in 1916.



UNEXCELLED

AMERICAN is now producing broaching tools faster than ever before. It is, therefore, surprising to note that the fine quality of AMERICAN broaches is still on a par with tools made in the period preceding the present emergency. Contribute this, if you will, to new equipment or conscientious employees—the factor is there!

AMERICAN BROACH & MACHINE CO.
ANN ARBOR, MICHIGAN, U.S.A.

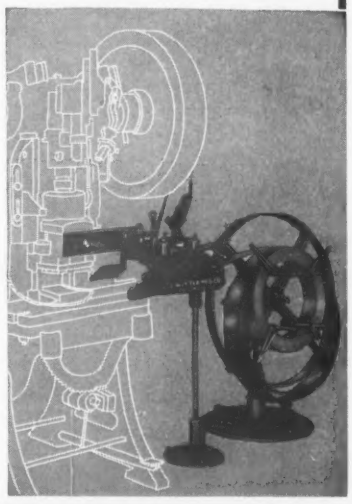
Increase Production **WITH**
WITTEK *Automatic* ROLL FEEDS AND REEL STANDS

for Any Make or Size Punch Press

Wittek Automatic Roll Feeds provide an improved and simplified method of punch press operation that insures rapid feeding under all conditions. Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions.

Wittek Adjustable Reel Stands provide automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and backlash of stock.

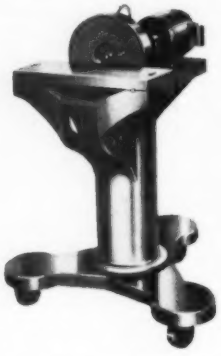
If your production problem involves feeding coiled stock to punch presses, it may be solved by consulting us. Your inquiry will be given immediate attention. Send for complete descriptive catalog.



WITTEK MANUFACTURING CO.
4307 W. 24TH PL., CHICAGO, ILL., U. S. A.

BRISTOL DIE GRINDER

A heavy-duty portable grinder for grinding die sections, rough castings, and trimming bar stock.



Capacity: 12" long, 7" high. Width of grinding face, 4". Tool, 8" x 22". Height to center of spindle, 38". 1 h.p. motor—1750 r.p.m. With Motor and Abrasive Wheel, F. O. B. Detroit, $645..00.

BRISTOL CO.
227 IRON ST. DETROIT

SHELDON Back Geared Screw Cutting PRECISION LATHES

For production:
Lever Operated Double Tool Posts
Lever Operated Collet Attachment
Lever Operated Tailstock

For any production jobs (often on second operation work) these moderate priced lathes will surpass in output much more expensive machine tools. Costing less than $750. (with motor included) the 10" Sheldon Manufacturing Lathe (illustrated) comes with Hand Lever Collet attachment (Collet capacity ¾"), Lever operated Double Tool Slide, Hand Lever Tailstock, Semi-Quick Change Gear Box. With 4-speed underneath motor drive enclosed in pedestal leg. It's a complete operating unit that can be set up anywhere.

Write for Catalog of 10", 11" and 12" Sheldon Precision Lathes.

SHELDON MACHINE CO., INC.
4252 No. Knox Street
Chicago, Illinois, U.S.A.

CLASSIFIED ADVERTISING
THE TOOL ENGINEER
2842 W. Grand Blvd. Detroit, Mich.

SITUATIONS WANTED

MANUFACTURERS REPRESENTATIVE with full coverage state of Michigan is desirous of obtaining connection with reputable manufacturer of solid high speed metal cutting tools. Can give immediate results. Large clientele. Twenty years experience in cutting tool field. Box 725, The Tool Engineer.

SITUATIONS AVAILABLE

SALESMAN, Small Tools For Metropolitan District of New York—Salary and Commission—Experienced Man only. Box 722, The Tool Engineer.

CAPABLE TIME STUDY MAN. Must be experienced in Carbide Tungsten and other tool equipment. In reply give references, experience, and salary wanted. Ferracute Machine Co., Bridgeton, N. J.

HIGH SPEED STEEL METALLURGIST to take charge of heat treating department of rapidly expanding small tool manufacturer. Steady business now employing about 300 offers exceptional opportunities. Metallurgist must be capable at directing research work in hardening small high speed tools. Age preferred 25-35. Starting salary $4000.00 and bonus. Location Middle West. Box 723, The Tool Engineer.

WANTED
TOOL DESIGNERS
Draftsmen, layout men, detailers.
Diesel or gas engine experience preferred.
Chicago Area
Box 724, The Tool Engineer

LESS OPERATIONS
AND FAR
BETTER WORK
WITH A
GATCO
ROTARY PILOT BUSHING
Pilot and bushing fits with a PUSH fit, therefore a perfect bore
ROUND-CHATTERLESS-SMOOTH

DUST-PROOF

AS A WATCH

GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

Write for full information and prices

GIERN & ANHOLTT TOOL COMPANY
1312 Mt. Elliott Avenue, Detroit, Michigan

U S HEADS
STANDARD SINCE 1915

30 DIFFERENT STANDARD SIZE ADJUSTABLE DRILL HEADS, CAPACITIES UP TO 1½" DRILLS

SEND US YOUR B/PS

All Types of Fixed Center Heads

UNITED STATES DRILL HEAD CO.
Cincinnati, Ohio

GARRISON GEAR CHUCKS

are used on—

- GEAR SHAPERS
- DRILL PRESSES
- ENGINE LATHES
- TURRET LATHES
- INTERNAL GRINDERS
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- OSCILLATING GRINDERS
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and are used for—

Grinding . . . Precision Boring . . . Machining and other operations on Spur . . . Internal . . . Bevel . . . Cluster . . . Helical and Herringbone Gears.

GARRISON
MACHINE WORKS, INC.
DAYTON OHIO

INCREASE YOUR PRODUCTION

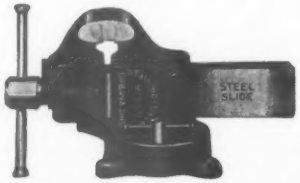
WITH

DESMOND GRINDING WHEEL DRESSERS & CUTTERS

Your grinding wheels will grind faster and more accurately if frequently dressed with Desmond Dressers. We manufacture the only complete line of these wheel truing tools.

Write for copy of Catalog "T" and name of your nearest jobber who can supply you with our Dressers and Cutters.

SIMPLEX STEEL SLIDE VISES



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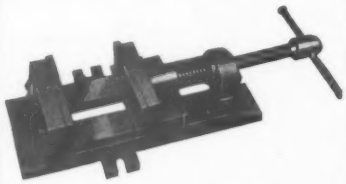

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DECEMBER MEETINGS

BOSTON—Dec. 18. Dinner 6:30 P.M. Walker Memorial Building, Massachusetts Institute of Technology. Malcom F. Judkins, Chief Engineer of Firthite Division of Firth Sterling Steel Company will speak on the subject of Tungsten Carbide.

BUFFALO—Dec. 18. 6:30 P.M. University Club, Buffalo. Frank W. Curtis, National President, will have for his subject Tool Engineering as Applied to Tool Design.

CLEVELAND—Dec. 13. 6:30 P.M. The Mid-Day Club. There will be a dinner dance and floor show as it is the fifth annual Christmas Party. Reservations: Wm. Reiff, Jr. Main 0112.

DETROIT—Dec. 11. Dinner 6:30 P.M. Detroit Leland Hotel. Dinner tickets for members will be $1.50 and nonmembers $1.75. Frank W. Curtis, National President, will speak on the subject of Tool Engineering.

GREATER NEW YORK — Dec. 1. Dinner 6:30 P.M. Coffee Shop. 8:00 P.M. Hotel New Yorker. L. C. Weller, Works Laboratory, General Electric Company, will speak on the subject of High Speed Photography of Cutting Tools.

PEORIA — Dec. 6. 6:30 P.M. Pere Marquette Hotel. This will be Ladies Night and there will be a dinner and a dance. Reservations: E. Bowtan, 412 Thrush Avenue.

PHILADELPHIA — Dec. 18. 6:15 P.M. Engineers Club of Philadelphia, 1317 Spruce Street, Philadelphia. "Steel for the Ages" a motion picture will be shown under the auspices of the Allegheny-Ludlum Steel Corporation. This will be followed by Christmas entertainment.

PITTSBURGH — Dec. 5. 6:30 P.M. McCann's Restaurant. The guest speaker will be Dr. Allen Bates who will have for his subject Metals Versus Non Metals.

ROCHESTER—Dec. 10. Dinner 6:30 P.M. Technical Session 7:45 P.M. University of Rochester. Dinner will be in Todd Union and the talk will be in Lower Strong Auditorium. W. B. Scott will talk on the subject of New Bronzes and Applications in Defense. Reservations: C. G. Newton. Stone 2893.

ROCKFORD — Dec. 4. 6:00 P.M. Hotel Faust, Rockford, Illinois. This is to be Ladies Nite. Dr. John Caton, Director of Educational Research and Engineering at the Chrysler Corporation, will speak on the subject Common Sense in Education.

ST. LOUIS—Dec. 11. 6:30 P.M. Melbourne Hotel. The speaker for the evening will be Leon Dwyer who will talk on Gages.

SCHENECTADY—Dec. 11. 6:30 P.M. Y.W.C.A., Troy, New York. J. C. Davidson will be the speaker and his subject is Diesel Engines. Reservations: N. Y. Coxe, Room 235, G.E. Co., Schenectady.

SOUTH BEND—Dec. 9. 7:00 P.M. Indiana Club. The guest speaker will be Frank W. Curtis, National President,

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MEETINGS

and the subject will be Tool Engineering. This is Ladies Nite. Reservations: Glave Bunch.

SPRINGFIELD — Dec. 8. Highland Hotel, Springfield, Mass. M. O. Saunders of the City Planning Board will be the coffee talker. He will give a brief outline of air raid precaution in the Springfield area. Herman F. Zorn of the V & O Press Company, Inc., Hudson, New York, will be the technical speaker, his subject will be Punch & Die—Press Work.

SYRACUSE — Dec. 9. Onondaga Hotel, Syracuse, N. Y. The Bubble Girls will entertain during dinner. The technical speaker will be J. B. Wilkie, Gage Engineer, Pratt & Whitney Co., his subject will be Latest Developments in Gaging Methods. The talk will be illustrated with slides and table exhibits of electri-gages.

TWIN CITIES—Dec. 10. 6:30 P.M. Dunwoody Industrial Institute. The speaker will be H. A. Frommelt, Director of Industrial Research, Kearney & Trecker Corp., his subject will be Plastics in National Defense.

TWIN STATES—Dec. 10. 6:30 P.M. Masonic Temple. The Speaker will be Jeffe Pillings who will talk on The Effect of Lubricant in Grinding.

WESTERN MICHIGAN — Dec. 8. 6:45 P.M. Rowe Hotel. Frank W. Curtis and Clyde L. Hause, A.S.T.E. national officers, will speak on Tool Engineering.

WORCESTER — Dec. 15. 6:30 P.M. Putnam & Thurston's Restaurant. Tonight is known as "Fun Night."

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THE TOOL ENGINEER

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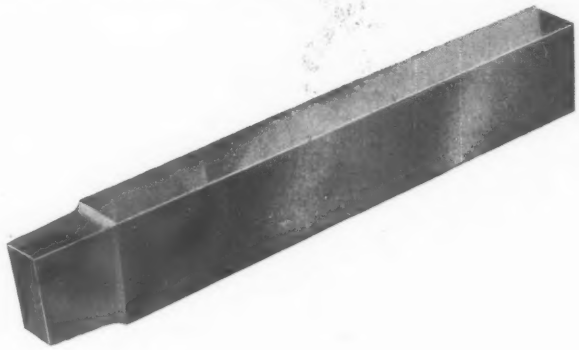

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Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2

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Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Right—200 Series

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2

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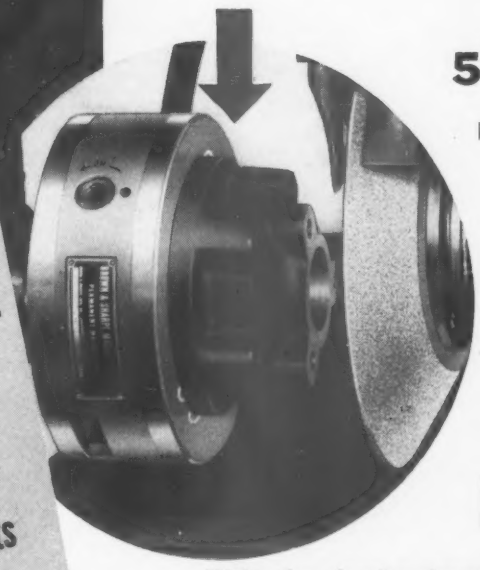

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